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EMISSIONS AND DISPERSION MODELING SYSTEM (EDMS) REFERENCE MANUAL

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13. ABSTRACT (Maximum 200 words)
The Emissions and Dispersion Modeling System (EDMS) was developed in the mid-1980s as a complex source microcomputer model to assess the air quality impacts of proposed airport development projects. In response to the growing needs of the air quality analysis community and changes in regulations (Conformity requirements from the Clean Air Act Amendment of 1990) the Federal Aviation Administration (FAA) in cooperation with the United States Air Force (USAF) has re-engineered and enhanced EDMS. EDMS Version 3.0 was built under the guidance of a government and industry advisory board composed of experts from the scientific, environmental policy, and analysis fields. It features the latest aircraft engine emission factors from the International Civil Aviation Organization (ICAO) Engine Exhaust Emissions Data Bank, vehicle emission factors from the Environmental Protection Agency's (EPA) MOBILE5a, EPA-validated dispersion models, and improved performance. The analyst can more effectively determine emission levels and concentrations generated by the typical airport/air base sources (i.e. aircraft, ground support equipment) as well as the airport/air base associated emissions contributors such as motor vehicles and power plants.

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PREFACE

The Emissions and Dispersion Modeling System (EDMS) was developed in the mid-1980s as a complex source microcomputer model designed to assess the air quality impacts of proposed airport development projects. In response to the growing needs of the air quality analysis community and changes in regulations (Conformity requirements from the Clean Air Act Amendment of 1990) the Federal Aviation Administration (FAA), in cooperation with the United States Air Force (USAF), has re-engineered and enhanced EDMS. EDMS Version 3.0 was built under the guidance of a government/industry advisory board composed of experts from the scientific, environmental policy, and analysis fields. It features the latest aircraft engine emission factors from the International Civil Aviation Organization (ICAO) Engine Exhaust Emissions Data Bank, vehicle emission factors from the Environmental Protection Agency's (EPA) MOBILE5a, and EPA-validated dispersion models. The analyst can more effectively determine emission levels and concentrations generated by the typical airport/air base sources (i.e., aircraft, ground support equipment) as well as the airport/air base associated emissions contributors such as motor vehicles and power plants.

This Reference Manual is intended to provide detailed information on the functionality of the model and acts as an extension and elaboration of the on-line help. The section on References provides an extensive listing of documents that may be of further assistance to the analyst in the use of EDMS and the preparation of an Environmental Impact Statement (EIS).

Section One provides information on software requirements and the installation process. Sections Two, Three, Four, and Five present a detailed description of the functionality of the model, including the inputs, outputs, related equations, and tools. A printout of the on-line help with screen captures is incorporated as Section Six. The DBF format data files used by the model are included as Appendix A, and a tutorial is included as Appendix B.

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The Office of Environment and Energy (AEE) wishes to acknowledge the extensive contributions by CSSI, Inc. in providing model development and support. Specifically, we wish to thank Steve Murray, Program Manager, William Colligan, Technical Director, Don Embt, Project Leader, and team members Stephen Augustine, Ted Thrasher, and Charles Anderson for their invaluable efforts. We also wish to acknowledge the members of the Emissions and Dispersion Modeling System (EDMS) Design Review Group (DRG) and independent reviewers for their recommendations for improvements.

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1. EMISSIONS AND DISPERSION MODELING SYSTEM (EDMS)

1.1 Hardware Requirements

The EDMS software runs on a PC with the following minimum hardware requirements:

- Intel 486 processor operating at 66 MHz
- 8 Mbytes RAM (16 Mbytes recommended)
- 300 Mbytes disk storage
- 3.5 inch 1.44Mbytes floppy disk drive
- Mouse or other pointing device

1.2 Operating System Requirements

The EDMS software is a 16 bit Windows™ 3.1 native application, compatible with the following operating systems:

- Microsoft® Windows™ 3.1 and DOS 6.x
- Microsoft® Windows™ 95
- Microsoft® Windows™ NT

1.3 Installation Procedures

The EDMS software, data files, and example studies are provided on two installation diskettes. To install the EDMS software and components:

- Insert "Installation Disk 1" in your 3.5 inch floppy disk drive.
- At the Program Manager *Run* command line type "a:\setup" (assuming floppy drive is the a:\ drive) or, from the Windows™ File Manager, double-click on the *setup.exe* file found on Installation Disk 1.

The EDMS setup program will then guide you through the installation process. You will have the option of installing the EDMS 3.0 software files complete with example studies, or installing the software files only. A complete installation (software and example studies) requires about 6 megabytes of hard-drive space. When the installation setup is complete, an EDMS folder will be created with icons to launch the model, the on-line help, the example studies, and the un-installer program for removing EDMS from the system.

2. BACKGROUND INFORMATION

2.1 History

EDMS is a combined emissions and dispersion model for assessing air quality at civilian airports and military air bases. The model was developed by the Federal Aviation Administration (FAA) in cooperation with the United States Air Force (USAF). The model is used to generate an inventory of emissions generated by sources on and around the airport or air base, and to calculate pollutant concentrations in these environments.

In the early 1970s, the FAA and the USAF recognized the need to analyze and document air quality conditions at and around airports and air bases. Each agency independently developed computer programs to address this need. The USAF developed the Air Quality Assessment Model (AQAM) and the FAA developed the Airport Vicinity Air Pollution Model (AVAP). These models were used to perform limited air quality assessments in the late 1970s. Recognizing the inefficiency of maintaining two non-EPA approved models, the agencies agreed to cooperate in developing a single system that would have regulatory, operational and economic benefits. The result was the EDMS development effort jointly supported by both agencies and leading to a model listed among the EPA's preferred guideline models.

Emissions modeling in the FAA began with the early Simplex A modeling efforts using the HP-97 calculator. The Simplex A algorithms included calculations for aircraft takeoff plume dispersion. In the 1980s, the model was moved to the Apple II computer and the Simplex A algorithm was expanded to include dispersion calculations for roadways, parking lots, and power plant sources. The revised and enhanced Simplex A model became known as the Graphical Input Microcomputer Model (GIMM). GIMM was ported to a PC and further enhanced by improvements in processing speed and refinement of the emissions inventory calculations. This enhanced version of GIMM became known as EDMS. The new EDMS (Version 3.0) operates under the Microsoft® Windows™ environment.

Today, EDMS is the FAA-preferred model for air quality assessment at the airport and air bases. It is one of the few air quality assessment tools specifically engineered for the aviation community. EDMS includes emissions and dispersion calculations, a database of emission factors for civilian and military aircraft, a database of emission factors for civilian ground support equipment and military aerospace ground equipment, and a report module that generates standardized reports.

2.2 System Architecture

2.2.1 Components and Modules

In offering functionality for performing both an emissions inventory and dispersion modeling, EDMS consists of several layers of interaction as depicted in Figure 2-1. This figure is a high level representation of the interaction between different components within the framework of a single integrated environment.

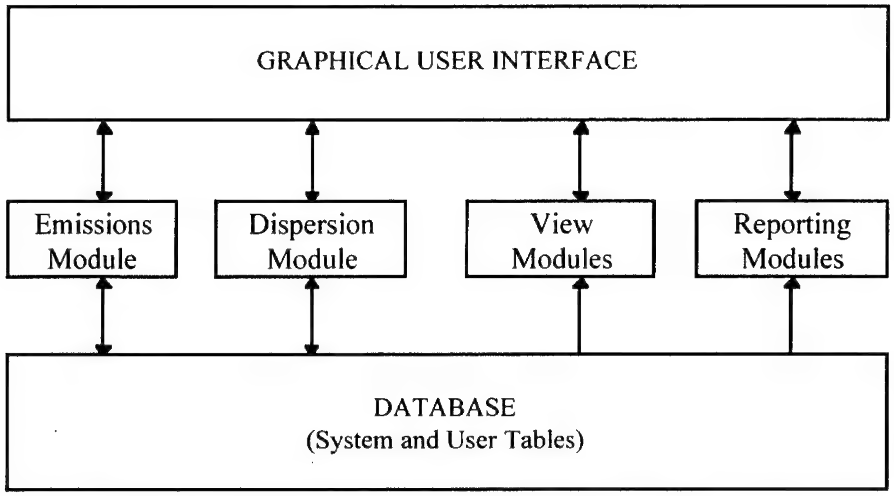


Figure 2-1: EDMS System Architecture and Components

The back-end for both the emissions inventory and dispersion modeling is the database comprising database tables for system data and user-created sources and results. The front end is the graphical user interface (GUI). The user interacts with the model and the database through the GUI. At the GUI level the user performs data entry (with parameter validation), executes commands, and receives visual feedback of both data entered and results generated.

The emissions inventory module incorporates EPA approved methodologies for calculating aircraft emissions, on-road and off-road vehicles emissions, and stationary source emissions. The dispersion modeling module incorporates EPA-validated dispersion models (PAL2 and CALINE3) for the various emissions source types. Both of these components interact with the database to retrieve and store data. EDMS offers the flexibility of allowing the user to perform an emissions inventory only or dispersion modeling only (i.e., the final results of one are not dependent on the final results of the other).

The view modules permit the user to view output and system data stored in the database in a raw form. They also allow the user to view a graphical representation of the various sources in the database. The last component of the model is the reporting component. Results of the emissions inventory and dispersion calculations are stored in and retrieved from the database and output as formatted reports to the printer. This provides the user with the official results of the study in a printed form.

2.2.2 Functional Flow

The EDMS functional flow is outlined in the flow diagram (Figure 2-2). This diagram provides a high-level map of the steps necessary to generate an emissions inventory or to perform dispersion modeling.

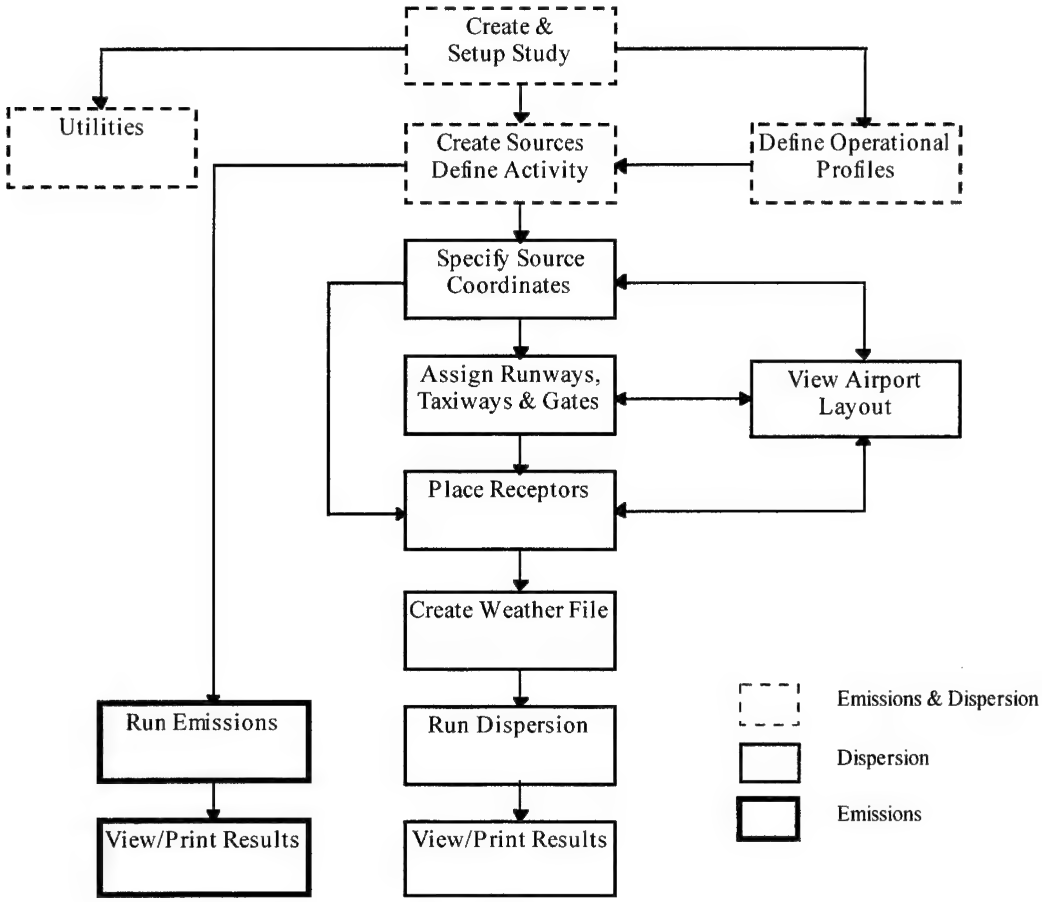


Figure 2-2: Emissions and Dispersion Flow Diagram

At the top level, the user creates a study and specifies global parameters. For both the emissions inventory and dispersion modeling, the user defines the nature and activity of the various emissions sources present in the study. The creation and specification of operational profiles (duty cycles) for various emissions sources are optional for the emissions inventory but necessary for accurate dispersion modeling.

At this stage the model contains all the data necessary to generate the emissions inventory. Upon completion of the run, the results may be viewed within the model and/or printed on a printer.

Dispersion modeling is significantly more complex in scope and complexity of data input. In calculating dispersion, the user is required to enter its location coordinates, select appropriate operational profiles, and define other source specific parameters for each emissions source included in the dispersion analysis. In the case of aircraft activity, the user may further define distinct runways, runway queues, taxiways, and gates, and assign these entities to each active aircraft. All entities with spatial coordinates may be viewed in relation to each other through an airport layout view. Such entities include receptors which constitute concentration estimation points within the coordinate system. Finally, weather data, consisting of weather variables for individual hours, is created and stored. At this point the user may run the dispersion analysis by selecting an existing weather file and specifying the duration of run. Upon completion of the run the results may be viewed within the model and/or printed on a printer.

In addition, the model incorporates utilities for importing and exporting some types of data, and allows the user to add customized aircraft types to the system database.

2.3 Features and Limitations

EDMS incorporates both EPA approved emissions inventory methodologies and dispersion models to insure that analysis performed with the application conforms to EPA guidelines. Since EDMS is primarily used in the process of creating an environmental impact statement, it is imperative that the application uses the most current data available. For this reason the database contains a comprehensive list of aircraft engines, ground support equipment, aerospace ground equipment, auxiliary power units, vehicular and stationary source emission factor data. However, there may be cases where the database does not contain a specific data element (i.e. emission factor). In these cases, EDMS tries to make allowances for the user to enter their own data and will perform parameter validation where possible. The pollutants currently included in the emissions inventory are CO, HC, NOx, SOx, and PM-10[1]. Other pollutants such as lead, ozone, and hazard air pollutants have not been included in the application because the data required to include these emissions is simply not available and in most cases there is no approved methodology for considering these pollutants.

EDMS performs dispersion analysis by incorporating dispersion models that have been previously developed. These models have many well known assumptions and limitations regarding their application and, consequently, are utilized appropriately within the application. Some of these assumptions include a simple or relatively flat terrain, conservation of mass (i.e. negligible chemical breakdown of original substance), and steady state atmospheric conditions over the averaging period of one hour. Additionally, Gaussian dispersion algorithms are limited to transport distances of less than 50 kilometers and do not consider complex aerodynamic effects such as downwash from buildings. The pollutants currently included in EDMS for dispersion analysis are CO, NOx, SOx, and PM-10. Concentrations of the included pollutants are generated for comparison with all the Primary NAAQS and most of the Secondary NAAQS.

[1] PM-10 data for ground support equipment, stationary sources, and training fires

3. EMISSION CALCULATIONS

3.1 Aircraft Activity

Aircraft activity at the airport includes landside and airside operations. EDMS defines four distinct modes of aircraft operation based upon EPA and FAA guidance: approach, taxi/idle, takeoff, and climb out. Together, these four modes constitute one Landing and Takeoff (LTO) cycle. EDMS calculates aircraft emissions based on these four modes.

3.1.1 Time-In-Modes (TIM)

Aircraft operate in each of the modes for a determined default time, or TIM, as designated by the EPA and published in the EPA publication *Procedures for Emission Inventory Preparation, Volume IV, Chapter 5.* Table 3-1 lists the time-in-modes for various aircraft categories.

Aircraft Category	Taxi/Idle	Takeoff	Climb out	Approach
Commercial				
Jet - Airliner	26.0	0.7	2.2	4.0
Turbo-Prop	26.0	0.5	2.5	4.5
Transport/Piston	13.0	0.6	5.0	4.6
General Aviation				
Business Jet	13.0	0.4	0.5	1.6
Turbo-Prop	26.0	0.5	2.5	4.5
Piston	16.0	0.3	5.0	6.0
Helicopter	7.0	--	6.5	6.5
Military				
USAF Jet	29.8	0.4	0.8	3.5
USN Jet	13.0	0.4	0.5	1.6
USAF Trainer/Turbine	19.2	0.4	0.9	3.8
USAF Trainer/T (general)	11.2	0.5	1.4	4.0
USN Trainer/Turbine	13.0	0.4	0.5	1.6
USAF Transport (general)	15.9	0.4	1.2	5.1
USN Transport	26.0	0.5	2.5	4.5
USAF B-52, KC-135	47.7	0.7	1.6	5.2
Piston	13.0	0.6	5.0	4.6
Helicopter	15.0	--	6.8	6.8

Table 3-1: Default Time-In-Modes for Various Aircraft Categories[2] (in minutes)

[2] Source: Procedures for Emission Inventory, Volume IV, Chapter 5. Mobile Sources, EPA, Ann Arbor, MI 1992. Because the takeoff mode for helicopters does not exist, there is no TIM for this mode for helicopters.

Approach: $T_{new} = T_{old} * H/3000$
Climb out: $T_{new} = T_{old} * [(H-500)/2500]$

Where:

T_{new}	-	new time in mode in minutes
T_{old}	-	old time in mode or default in minutes
H	-	mixing height in feet

Equation 3-1: Mixing Height and Aircraft Time-In-Modes[3]

EDMS accordingly makes use of these default numbers with the accompanying EPA recommendations. Of the four modes the taxi/idle mode is the most variable at different airports; thus, the taxi time can be changed by the user. The approach and climb out time will also change depending on the mixing height. Equation 3-1 is used to modify the default approach and climb-out time-in-modes based upon the mixing height. Because the TIM for takeoff is the least variable, there is no modification of takeoff time within the model.

3.1.2 Touch and Go

Touch and Go (TGO) operations are used for training purposes and usually occur at military bases or smaller civilian airports. A TGO operation is defined as a combination of the three modes (approach, takeoff, and climb out) and does not include taxiing. Even though the actual approach and climb out times may be less in a TGO operation than a normal LTO cycle, they are treated the same so as to take into account the time the aircraft spends in cruise mode while circling for the next TGO. A TGO operation may be specified in the EDMS for an emissions inventory.

3.1.3 Aircraft Engines

Aircraft engines are the actual source of emissions for an aircraft. EDMS treats each aircraft type as a combination of a specific airframe and engines. For each airframe there may be several different engine types available for use. Because these engines can originate from different manufacturers (or may be a different model), the emission factors may vary from engine to engine. Subsequently, different aircraft may generate identical emissions because they are equipped with identical engines, or older aircraft may be outfitted with newer engines and generate fewer emissions. If a "DEFAULT" engine is present for a particular airframe it represents an actual engine type which is the most common or widely used engine for that particular airframe.

In each of the four modes the engines operate at correspondingly different power settings. The power settings determine the rate at which fuel is burned which, in turn, determines the quantity and nature of emissions released into the atmosphere. Equation 3-2 gives the equation for calculating the emissions generated from an aircraft in a specific mode.

[3] These formulas assume that the transition from takeoff to climb out occurs at 500 feet.

$$E_{ij} = \Sigma\,(TIM_{jk}) * (FF_{jk}/1000) * (EI_{ijk}) * (NE_j)$$

Where:

E_{ij}	-	Total emission of pollutant *i*, in pounds, produced by aircraft type *j* for one LTO cycle.
TIM_{jk}	-	Time in mode for mode *k*, in minutes, for aircraft type *j*
Ff_{jk}	-	Fuel flow for mode *k*, in pounds per minute, for each engine used on the aircraft type *j*
Ei_{ijk}	-	Emission index for pollutant *i*, in pounds of pollutant per one thousand pounds of fuel, in mode *k* for aircraft type *j*
Ne_j	-	Number of engines used on aircraft type *j*

Equation 3-2: Calculate Emissions for an Aircraft[4]

3.2 Aircraft Support Equipment

Emissions are also generated by ground support vehicles, generators, and auxiliary power units (APUs) while the aircraft is parked at the gate. The following sections cover Ground Support Equipment (GSE), Aerospace Ground Equipment (AGE), and APUs.

3.2.1 GSE and AGE

Upon arrival at the gate, the aircraft is met by GSE to unload baggage and food carts, and to service the lavatory and cabin of the airplane. While the aircraft is parked at the gate, there are generators in operation to provide electricity and air. If the aircraft is scheduled to depart, GSE is present to load baggage and food carts, and to refuel. When the aircraft departs from the gate, an aircraft tug is used to push the aircraft from the gate and tow it to the taxiway. Figure 3-1: Aircraft and GSE depicts aircraft and GSE activity at the gate. In EDMS, GSE is assigned to aircraft based upon the type of service. For example, a fuel truck servicing a large commercial aircraft will have a different operation time than the same fuel truck servicing a commuter aircraft. Tugs are generally used only to move most commercial aircraft away from the gates but no tugs are assigned to general aviation (GA) aircraft. These assumptions are used in the EDMS, but the user also has the flexibility to add and remove GSE to and from aircraft and modify the operation time for GSE.

GSE emission factors contained in the EDMS database are derived from the document *Technical Data To Support FAA's Advisory Circular On Reducing Emissions From Commercial Aviation* (Reference 11). GSE emission factors are based on the following variables: brake horse power, load factor, fuel type, and coolant type. AGE emission factors are derived from the *Calculation Methods For Criteria Air Pollutant Emission Inventories* (Reference 3). In EDMS, GSE and AGE emission factors are given in kilograms per hour. With an operation time per LTO cycle given in minutes, the calculation for emissions generated per LTO cycle is the product of the emission factor and operation time. For annual emissions this result is multiplied by the number of yearly LTO cycles for the specific aircraft to which the equipment is assigned.

[4] Source: Procedures for Emission Inventory Preparation, Volume IV, Mobile Sources, EPA, Ann Arbor, MI, 1992.

Figure 3-1: Aircraft and GSE

3.2.2 Auxiliary Power Units (APU)

Auxiliary power units are most often on-board generators that provide electrical power to the aircraft while its engines are shut down. Some pilots start the on-board APU while taxiing to the gate but, for the most part, it is started when the aircraft reaches the gate. The on-board APU is, in effect, a small jet engine and the calculations for the emissions generated by it are similar to that of an aircraft engine operating in one power setting only. The methodology for calculating emissions from APUs is adapted from the U.S. *EPA's Procedures for Emission Inventory Preparation, Volume IV,* Chapter *5* (Reference 7). For emissions calculations purposes, APUs are assigned to the same category as GSE and AGE. An APU is assigned an operating time per LTO cycle and its emission factors are given in terms of kilograms per hour. External APUs used by an aircraft fall into the category of ground support equipment. In the absence of an APU a combination of 400 Hz electric power and preconditioned air (PCA) must be supplied to the aircraft at each gate to allow for normal operation. These methods usually generate little or no emissions at the airport and are not included in EDMS.

3.3 On-Road Vehicles

On-road vehicles are used to transport people and supplies to and from the airport or air base. These vehicles also utilize parking facilities at the airport or air base. Vehicle activities such as movement on the roadways and in the parking lots, and idling at intersections and in parking lots, are some of the variables in calculating vehicle emissions. Other variables used in vehicle emissions calculations include distance traveled, vehicle age, speed, site elevation (greater than 5000 feet = high altitude), and total number of vehicles. Vehicular emission factors[5] are obtained from the EPA's MOBILE5a and PART5 programs and are stored for fleet years 1988 to 2010, 14 different vehicle speeds, temperatures from 0 to 100 degrees Fahrenheit in 5 degree increments, and high and low altitudes. To accommodate changing and/or varying regulations, the user has the option of entering their own vehicular emission factor data. Frequently the user would obtain this emission factor data by running the MOBILE5a and PART5 programs with customized input or specifications. Equation 3-3 shows the various formulas used to calculate emission factors for parking lots based upon on-road moving vehicle emissions and on-road idle vehicle emissions.

[5] The EDMS uses composite or weighted average emission factors based upon a default fleet mix.

Idle Factor: $EF_i = EF_{2.5} \times 2.5 \times T$

Moving Factor: $EF_m = EF_s \times D$

Composite Lot Factor: $EF_t = EF_i + EF_m$

Where:

EF_i	-	the idle emission factor in gm/veh
EF_m	-	the moving emission factor in gm/veh
$EF_{2.5}$	-	the emission factor at speed 2.5 mph in gm/veh-mile
EF_s	-	the emission factor at speed *s* mph in gm/veh-mile
EF_t	-	the composite emission factor in gm/veh
T	-	the idle time in minutes
D	-	the distance traveled in miles

Equation 3-3: Parking Lot Emission Factor Calculation

3.4 Stationary Sources

Stationary sources at the airport include power and heating plants, incinerators, surface coating, de-icing operations, fuel storage tanks, etc. The general methodology for calculating emissions from these sources considers the amount of fuel burned and the duration of operation as expressed in Equation 3-4. EDMS allows the user the flexibility to identify generic stationary sources. For such sources the user is required to provide emission factors. This data can be found in EPA's *Compilation of Air Pollutant Emission Factors, Volume I.*

$$E_{ti} = \Sigma (F \times EI_i)$$

Where:

E_{ti}	-	total emissions of pollutant *i,* in kilograms, from the stationary source for the given time period *t*.
F	-	total amount of fuel consumption for given time period; liquid fuels should be expressed in terms of thousand gallons, natural gas as thousands of cubic meters, and solid fuels in metric tons
EI_i	-	emission index for pollutant *i* (kilograms of pollutant per thousand gallons, cubic meters, or metric tons)
i	-	pollutant (CO, HC, NOx, SOx, PM-10)

Equation 3-4: Total Pollutant Emissions for Stationary Source

3.5 Emissions Inventory

An emissions inventory is a summary of the total pollutants generated by all active sources in the study. Using EDMS to perform an emissions inventory requires the user to identify the emission sources, the annual activity for each of these sources and, in the case of user-specified stationary sources, the emission factors. EDMS then calculates the total annual pollutant emissions for each of the identified sources and presents it in both a summarized report and a detailed report.

3.5.1 Data Input

EDMS emissions sources data input screens contain fields required for both the emissions inventory and dispersion analysis. With the exception of the aircraft screen, input fields necessary for the emissions inventory are displayed in the upper half of each screen. The parameter values for individual records are displayed by selecting the record in the *In Study* list box. These values may then be modified and changes made to a record are "applied" before moving to a different record. Parameter validation is provided at this interface level. In the event of an invalid entry, the user is notified with the range of acceptable values.

Two similar parameters found in all the emissions sources screens are the values for *Yearly* and *Peak Hour* activity. For most emissions inventory cases the analyst would obtain annual activity numbers. However, if the activity at peak hour is the only known variable then the user would create a set of operational profiles (see sections 6.1.3, 6.1.4, 6.1.5), under the *File* menu, that accurately represent the distribution of this activity over an entire year. Upon entering the value for *Peak Hour* and choosing the appropriate *Hourly*, *Daily*, and *Monthly* operational profiles (lower half of the screen) the program will automatically compute the corresponding *Yearly* value.

3.5.1.1 Aircraft

Aircraft activity is specified by adding records in the *Aircraft Activity and LTO Cycles* dialog box found under the *Emissions* menu heading. To specify aircraft to be included in the study, choose an airframe from the *Available* list box and engine type from the *Engine* drop-down box and *Add* it to the *In Study* list box. Aircraft activity is expressed in *LTO Cycles* (see section 3.1). There is no provision to define arrival numbers and departure numbers independently of each other. Touch and Go (*TGO per Year*) values (see section 3.1.2) may also be specified. *Taxi Time - In/Out* is the total time spent in taxiing and idling during a complete LTO cycle. This value is used only for the purposes of the emissions inventory and is not replaced or adjusted by time specifications in any other screen. Upon exiting the dialog box, a default assignment is made of GSE or AGE and APU for each newly added aircraft. This process may take a few seconds and is indicated by the display of the hourglass cursor.

3.5.1.2 GSE or AGE

GSE or AGE and APU are specified in conjunction with aircraft in the study. To modify the assignment and/or the operation time of these sources, open the *GSE/AGE & APU Assignments* dialog box found under the *Emissions* menu heading. For most aircraft in the EDMS database, default assignments of GSE, AGE, and APU exist which are displayed in the *Assigned GSE/AGE & APU* list box. These default assignments are based upon several categories of aircraft types (e.g., wide body jets, cargo planes, commuter aircraft, general aviation, military jets, military transports, business jets, etc.). Each GSE/AGE and APU carries a default operational time in minutes associated with one complete LTO cycle of the aircraft. If site specific information is available for GSE/AGE (assignments and operational times), it is recommended that this data be used in place of the defaults. If the aircraft type is removed from the study, all the GSE assigned to it will also be removed from the study.

3.5.1.3 Stationary Sources

The EDMS database contains emission factors for several categories of stationary sources. Each broad category is further broken down into several specific types. The categories currently included are *Incinerators, Power/Heating Plants, Fuel Tanks, Solvent Degreasers,* and *Surface Coating Facilities.*

Of these categories the first two are combustion sources and the next three are non-combustion sources. The treatment of stationary sources in EDMS has been simplified to use default data for parameters such as percent controls, percent ash, and percent sulfur for combustion sources, and average monthly temperatures for non-combustion sources. The emission factors for specific fuels under fuel tanks were derived from computations that included a default value for percent vapor recovery, and specific values for molecular weight, density and true vapor pressures (at different temperatures). For each fuel type, computations were carried out for two types of fuel tanks: fixed roof and floating roof. The resulting emission factors were averaged to give the composite emission factors for different fuels for both fixed and floating roof fuel tanks. The emission factors for specific coating fluids under surface coating facilities were derived from computations that included a default value for percent control, and specific values for percent VOC in solvent, density, and percent of solids by volume.

To specify stationary source activity the *Stationary Sources* dialog is selected from the *Emissions* menu heading. Upon selection of a *Category* the first listing in the *Type* drop down menu is automatically selected and its emission factors are displayed in the *CO, HC, NOx, SOx*, and *PM-10* edit fields. Typically the user will then select a *Type* that matches the source that they wish to include in the study. The *Category* and *Type* fields are keys to retrieve default data from the database. Based upon the nature of the fuel or substance used the emission factors are displayed either as *Kg/Metric Ton*, *Kg/Kiloliter*, or *Kg/Thousand Cubic Meters*. These emission factors may be modified if the user obtains site specific emission factor data, but there is no validity checking performed to verify that the modified emission factors are actually valid for the selected *Category* and *Type*. The *Per Year* and *Peak Hour* values specify the amount of fuel or substance used, and these are specified in either *Metric Tons*, *Kiloliters*, or *Thousands of Cubic Meters* as appropriate. For other stationary sources, the user has the option of choosing the *Other* category and entering their own emission factors in *Kg/Metric Ton*.

3.5.1.4 Training Fires

Training fire activity is specified by selecting the *Training Fires* dialog under the *Emissions* menu heading. Emission factor data for three fuels (*JP-4*, *JP-8*, and *Propane*) are stored in the EDMS database and may be selected under the Fuel Type drop down list box. Training fire emission factors are specified in kilograms of pollutant per gallon of fuel used and hence the training fire activity values are entered in *Gallons of Fuel Used*. Training fire emission factors may not be modified, but since stationary sources and training fires are treated in the same way, the user has the option of entering specific training fire data (for other fuels) in the *Stationary Sources* dialog.

3.5.1.5 On-Road Vehicles on Roadways

Motor vehicle activity on roadways is specified in the *Roadways* dialog (under the *Emissions* menu heading). The *Number of Vehicles* (*Yearly* or *Peak Hour*) refers to the distinct number of individual vehicles using the roadway. The average speed (in mph) of vehicles traveling on the roadway (*Speed)*, is one of the parameters necessary to determine a MOBILE5a emission factor (gm/veh-mile) for the movement of the vehicles. The other three parameters are the global parameters of *Vehicle Fleet Year*, altitude (*Elevation*), and *Average Yearly Temperature,* as defined in the *Study Setup* dialog. The *Roadway Length* (miles) field is used exclusively for emissions inventory purposes to determine the total amounts of pollutants generated by vehicles traveling the length of the roadway. Note that modifications to the x and y coordinates in the lower half of the screen will automatically compute and display the roadway length as determined by the coordinates. The *Edit Emissions* button provides access to the roadway emission factors for the active record both for viewing and editing purposes.

3.5.1.6 On-Road Vehicles on Parking Lots

Motor vehicle activity in parking lots is specified in the *Parking Lots* dialog (under the *Emissions* menu heading). The *Number of Vehicles* (*Yearly* or *Peak Hour*) refers to the distinct number of individual vehicles using the parking lot. An entry and an exit of the parking lot with any idling and vehicle movement together count as one operation. The average speed of vehicles traveling in the parking lot (*Speed In Lot)*, is one of the parameters necessary to determine a MOBILE5a emission factor for the movement of the vehicles. The other three parameters are the global parameters of *Vehicle Fleet Year*, altitude (*Elevation*), and *Average Yearly Temperature,* as defined in the *Study Setup* dialog. Idle emission factors (gm/veh) are computed by extracting emission factors, as above, with a vehicle speed of 2.5mph and modifying these factors with the *Avg. Idle Time.* The input for the idle time is an estimate of the average time a vehicle spends idling between entry and exit. The input for *Avg. Distance Traveled in Lot* is an estimate for the average distance a vehicle travels between entry and exit. This field is used to modify the moving emission factors (gm/veh-mile). The moving emission factors and the idle emission factors are combined to produce a parking lot emission factor (gm/veh) (Equation 3-3). The *Edit Emissions* button provides access to these computed parking lot emission factors for the active record both for viewing and editing purposes.

3.5.2 Data Output

The emissions inventory totals may be generated by selecting *Run Emissions Inventory* under the *Emissions* menu heading. The output may then be viewed, and printed.

3.5.2.1 View Emissions Inventory

The *View Emissions Inventory* window is displayed by selecting the appropriate option under the *View* menu heading. The initial display is the *Summary,* which shows total pollutant emissions, in tons per year, by source category. The current source categories are aircraft/APU, GSE/AGE, stationary sources (including training fires), vehicular sources (both roadways and parking lots), and the total of all categories. The analyst may also view total pollutant emissions by each source type by clicking on the appropriate buttons at the top of the view window.

The *Vehicular Sources* display lists the total emissions for each roadway and parking lot included in the study while the *Stationary Sources* display lists the total emissions for each stationary source or training fire specified in the study. The *Aircraft By Mode* display lists the total pollutants by the contributions of aircraft type in different mode of operation. The possible modes are approach, climb, takeoff, taxi (includes idling), touch-and-go, APU, and GSE/AGE. The summarized Aircraft and GSE/AGE is the sum of the first five modes due to the aircraft's activity. The GSE/AGE and APU totals are displayed separately.

All the displays may be printed by choosing *Print* option from the *File* menu heading. Printing in this case is WYSIWYG (What You See Is What You Get). *Printer Options* may have to be modified to enable complete printing of all the columns and rows.

3.5.2.2 Print Emissions Report(s)

To print official reports of the emissions inventory choose *Print Emissions Report(s)* from the *Reports* menu heading. With the difference of formatting, EDMS titles, and study information, the content of the emissions reports are almost exactly the same as described in *View Emissions Inventory.*

4. DISPERSION CALCULATIONS

The EDMS dispersion module uses the same Gaussian equations as many of the EPA's dispersion models. EDMS incorporates EPA's Point Area and Line (PAL2) and CALINE3 (CAlifornia LINE source) models for various emission sources.

PAL2 is a versatile dispersion model that incorporates modules for several kinds of emissions sources and these are: point sources, horizontal line sources, area sources, slant line sources, curved path sources, and special path sources. The PAL2 executable program, source code, and documentation are freely available on the EPA bulletin board at http://134.67.104.12/html/ttnbbs.htm.

CALINE3 was developed by CALTRANS, the California Department of Transportation, for predicting the dispersion from motor vehicles on or near highways and arterial roads. The CALINE3 executable program, source code, and documentation are also available freely from the CALTRANS web page (http://www.dot.ca.gov/) or from the EPA bulletin board.

Stationary sources such as power plants, training fires, fuel storage tanks and aircraft gates are considered point sources for dispersion calculations in PAL2. Parking lots are considered area sources for dispersion purposes. Aircraft queues are considered to be uniform line sources, whereas runways are considered to be accelerating line sources. Roadways are modeled using CALINE3. The variables involved in dispersion calculations include emission rates, emissions sources coordinates, weather data (temperature, wind speed, wind direction, and atmospheric stability), locations of receptors (points where concentrations are estimated), and operational profiles.

4.1 Weather Data

Weather data required for dispersion analysis includes mixing height, wind direction, wind speed and temperature. If local weather data is available or if the user wishes to conduct a screening dispersion run (worst case conditions) the user may enter this weather data into the model through the *Meteorological Data* dialog box under *Dispersion* menu heading. For refined dispersion runs, with actual weather data, EDMS offers the ability to import National Climatic Data Center weather data (see section 5.2). Since aircraft usually takeoff into the wind, the model offers the ability to define configurations that will dynamically place aircraft on runways, queues, and taxiways based upon the wind direction.

4.2 Atmospheric Stability

Atmospheric stability is a measure of turbulence or vertical movement of air or a measure of the ability of the atmosphere to dilute and mix air. Several factors determine the atmospheric stability; these include temperature, wind speed, cloud cover and solar radiation. EDMS uses the Pasquill Gifford stability classification. This classification expresses stability in the range of A (1) - F (6): very unstable - stable. Usually, stable conditions occur at night with a clear sky and low wind speeds. The opposite is true for unstable conditions, these usually occur during the day with cloudy skies and high wind speeds. For purposes of dispersion modeling a worst case scenario would probably include a stable atmosphere which leads to the reduction of the dispersion of pollutants by the slower vertical mixing of air. Atmospheric stability values can be obtain from the National Weather Service for a particular region and time.

4.3 Operational Profiles

Operational profiles are sets of load factors that together describe or profile the activity of a given source over the course of an entire year, hour-by-hour. See section 6.1.2 for a complete description.

4.4 Receptor Locations

The locations at which concentrations are estimated are known as receptors. EDMS allows the placement of receptors in the Cartesian coordinate system with the ability to also specify the height of the receptors. The height is not to be used to model the effects of complex terrain or make adjustments in any other way. EDMS does not perform any checking on the reasonableness or accuracy of the placement of receptors, it is left to the analyst to verify this for themselves.

As a general rule, receptors should be located where the maximum total projected concentration is likely to occur and where the general public is likely to have access. General guidance is given in Volume 9 guidance (EPA, 1978b) for receptor siting:

- places of expected maximum concentrations;
- places where the general public has access over the time periods specified by the NAAQS; and
- reasonableness.

Examples of reasonable receptor sites might be:

- sidewalks to which the general public has access on a more-or-less continuous basis;
- on the property lines of all residences, hospitals, rest homes, schools, playgrounds, and the entrances and air intakes to all other buildings;
- portions of a nearby parking lot to which pedestrians have continuous access.

Examples of unreasonable receptor sites might be:

- median strips of roadways;
- on or close to an aircraft runway or taxiway;
- within intersections or on crosswalks at intersections;
- tunnel approaches;
- within tollbooths; and
- a location far from the breathing height (1.8 m) at which the general public will not have access.

4.5 Point, Area, and Line Sources

Just as the emissions inventory breaks down airport operations into categories, the same applies to dispersion calculations, these three categories are point, area, and line sources. In the EDMS dispersion calculations, area and line sources are treated as collections of point sources. Hence the point source model is the basic building block for other kinds of sources.

4.5.1 Point Sources

In EDMS the activity at gates and stationary sources are considered to be point sources since the emissions are limited to a single point of discharge. Ground support equipment and

auxiliary power units are point sources located at the gate. Stationary sources such as power plants release pollutants into the atmosphere through a point source discharge mechanism such as a stack (training fires are also treated as point sources). The PAL2 point source module is used to model dispersion for all point sources in EDMS. Point source emission rates are generally given in grams per second (gm/sec).

4.5.2 Area Sources

Area sources are generally defined as an area with a uniform rate of emissions over the entire surface. Parking lots are classified as area sources in the model. Airport parking lots generate emissions due to on-road vehicles operations and vehicle idling. The PAL2 area source module is used to estimate dispersion from parking lots. This module considers an area source to be a grid of evenly spaced point sources. Area source emission rates are generally given in grams per second per square meter (gm/sec-m^2).

4.5.3 Line Sources

Aircraft taxiing, aircraft queuing, aircraft accelerating on the runway, and on-road vehicle operations are considered line sources, since their movement along a path approximates a line of continuous emissions.

The PAL2 slant line source module is used to estimate dispersion from the runway. This module allows for an accelerating mobile source along the length of the entire runway. The entire length of the runway is used for all aircraft on the runway. Concentration estimates at receptors will vary depending on the end of the runway from which the aircraft begins its takeoff roll. This is due to the closer spacing of points on the line source at the beginning of the runway.

CALINE3 is used to estimate dispersion from aircraft taxiing, aircraft queuing and motor vehicles on roadways. CALINE3 treats these operations as a uniformly distributed set of point sources along the length of the line source.

Line source emission rates are generally given in grams per second per meter (gm/sec-m) with the exception of the accelerating line source which is given in grams per second (gm/sec).

4.6 Dispersion Modeling

The intent of dispersion modeling is to assess the air pollutant concentrations at or near the airport or air base resulting from identified emissions sources. These pollutant concentrations are calculated to determine whether emissions from the site result in unacceptably high air pollution levels downwind by comparison with the National Ambient Air Quality Standards (NAAQS) or other relevant air quality standards. To perform dispersion modeling EDMS requires that coordinates (in meters or feet) are identified for each emissions source, the specification of an emissions rate (derived from emission factors) and its variation through time. For some sources, the release height, temperature and gas velocity are also required. The identification of spatial points in the coordinate system for concentration estimation (receptors), and the creation of weather data for individual hours are also required.

The basic Gaussian equation, a mathematical approximation that simulates the steady-state dispersion of pollutants from a continuous point source is given below:

$$C(x; y; z; H) = \frac{Q}{2\pi \sigma_y \sigma_z u} \exp\left[-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right] \left\{ \exp\left[-\frac{1}{2}\left(\frac{z-H}{\sigma_z}\right)^2\right] + \exp\left[-\frac{1}{2}\left(\frac{z+H}{\sigma_z}\right)^2\right] \right\}$$

Where:

C	-	point concentration at receptor, $\mu g/m^3$
H	-	effective height of emissions, m
Q	-	mass flow of contaminants from receptor, $\mu g/s$
u	-	wind speed, m/s
x,y,z	-	ground level coordinates of receptor, m
σ_y	-	standard deviation of plume concentration distribution in y plane, m
σ_z	-	standard deviation of plume concentration distribution in z plane, m

Equation 4-1: Gaussian Approximation[6]

The results of the EDMS dispersion calculations are the concentrations, given in micrograms per cubic meter ($\mu g/m^3$) and parts-per-million (PPM), at receptors for each hour.

4.6.1 Data Input

Data input to perform a dispersion analysis is significantly more involved than the data input for an emissions inventory (section 3.5.1). With a few exceptions all the input necessary for the emissions inventory is also necessary for dispersion modeling. In addition, the analyst is required to develop accurate operational profiles (see section 6.1.2), place receptors and create weather data. It is not necessary to generate the emissions inventory to run the dispersion algorithms since the emission rates used in dispersion calculations are derived directly from the emission factors.

The dispersion algorithms use the selected operational profiles (see section 6.1.2) to vary the source activity based upon the hour of the run. It is important that accurate profiles be developed to represent the variation of individual source activity as this can affect the outcome of dispersion significantly. Two similar parameters found in all the emissions sources screens are the values for *Yearly* and *Peak Hour* activity. The dispersion pre-processing routines use the *Peak Hour* value in the computation of an emission rate. If the *Yearly* activity is the only known variable then the user would use operational profiles to derive the *Peak Hour* value. Upon entering the value for *Yearly* activity and choosing the appropriate *Hourly*, *Daily*, and *Monthly* operational profiles (lower half of the screen) the program will automatically compute the corresponding *Peak Hour* value. Even if the *Peak Hour* value is known, and entered directly, accurate operational profiles will still have to be defined and selected for each source in the study.

Since EDMS is a dispersion model specifically developed for use at airports and air bases there are several screens that relate directly to the placement of aircraft activity and movement on

[6] Source: Air Quality Procedures for Civilian Airports and Air Force Bases, FAA/USAF, Washington, DC, 1997.

the airport. Data input includes the creation and specification of runways, queues, taxiways, and gates.

4.6.1.1 Aircraft

Aircraft activity is specified in the *Aircraft Activity and LTO Cycles* dialog box as described in section 3.5.1.1. The additional data required for dispersion analysis (other than operational profiles) are assigned in the *Aircraft Assignments* dialog box under the *Airport* menu heading. The *TGO Per Year* and *Taxi Time - In/Out* fields are not used in dispersion calculations, they are used solely for the emissions inventory. Dispersion is calculated for aircraft in the modes of taxi (on taxiways), idle (in queues), ground support equipment activity (at gates), and takeoff (on runways). At this time approved algorithms for the modes of approach and climb out are not available and hence their impacts are not included in the dispersion calculations and concentration estimates.

4.6.1.2 Parking Lots

Parking lot activity is specified in the *Parking Lots* dialog box as described in section 3.5.1.6. The additional data required for dispersion analysis is found in the lower half of the screen below the *Dispersion Input* divider. The *Dimensions* of the parking lot are specified with the specification of an *Origin* (x, y coordinates), the *Length* (north-south), and *Width* (east-west). Due to the functionality of the PAL2 area sources module dispersion analysis is only possible for rectangular lots that are oriented north-south and east-west. This may change in the future. The parking *Lot Height* is specified to represent the height at which emissions are released.

4.6.1.3 Roadways

Vehicle activity on roadways is specified in the *Roadways* dialog as described in section 3.5.1.5. The additional data required for dispersion analysis is found in the lower half of the screen below the *Dispersion Input* divider. Besides the *Coordinates* of the endpoints of the roadway, the surrounding *Terrain Roughness* (in meters) and the *Type* of roadway must also be specified. The latter two parameters are used by CALINE3 in its dispersion calculations. The *Terrain Roughness* values are derived from the CALINE3 manual Table 1 titled *Surface Roughness Lengths (Z0) For Various Land Uses* (Ref. 3). Similarly the roadway *Type* values [At Grade (AG), Bridge (BR), Fill (FL), and Depressed (DP)] are also derived from the CALINE3 manual section 5.5 *Site Geometry*. Elevated highway sections may be of either the fill or bridge type.

4.6.1.4 Stationary Sources

The *Stationary Sources* dialog described in section 3.4 offers the capability of specifying the activity of several different categories of stationary sources for dispersion analysis. The additional data required for dispersion analysis is found in the lower half of the screen below the *Dispersion Input* divider. Since all stationary sources are treated as point sources a single set of *Coordinates* are specified along with an effective *Source Height* (release height) of the emissions. *Source Diameter*, the diameter of the stack or other discharge mechanism, and *Gas Velocity*, the velocity of the escaping gases, are specified for all source kinds. The *Temperature* refers to the temperature of the escaping gases and is only applicable to combustion sources. The *Other* category assumes a combustion source. For non-combustion sources ambient air temperature plus an offset is assumed for dispersion calculations. If the analyst is unable to obtain accurate values for these parameters the default values may be used.

4.6.1.5 Training Fires

The treatment of training fires is identical to that of a combustion source in the stationary sources dialog. Please refer to section 3.5.1.4 for the *Training Fire* activity input and the preceding section for dispersion parameter inputs.

4.6.1.6 Runways

Aircraft runways may be defined using the *Runways* dialog box found under the *Airport* menu heading. Runways are named based upon their magnetic orientation. For example, runway 9-27 is a runway oriented east-west, with runway 9 defining aircraft moving west to east, and runway 27 defining aircraft moving east to west. The *Runways* dialog allows the user to create runways with distinct endpoints (End 1 and End 2). This, in turn, allows the user to assign aircraft to specific runway ends in both the *Configurations* dialog (section 4.6.1.9) and the *Aircraft Assignments* dialog (section 4.6.1.10).

In conjunction with each runway endpoint, the user may define a *Runway Queue*. The two queues of varying lengths, but the average *Time in Queue*, which specifies the average time an aircraft can expect to spend in the queue, is the same for each distinct runway. An aircraft assigned to a specified runway endpoint will, by default, use the queue attached to that endpoint. The only exceptions to this behavior will occur if either that *Time in Queue* is zero, or if the queue length as determined by its coordinates is less that 20 meters, in which case the aircraft assigned to that runway endpoint will not use any runway queues. Runways must have a length greater than or equal to 100 meters (328 feet).

4.6.1.7 Taxiways

Aircraft taxiways are defined through the *Taxiways* dialog box found under the *Airport* menu heading. The *Coordinates* of the taxiway essentially identify a line source for the placement of aircraft movement while the aircraft is taxiing to and from a gate. The *Taxi Time* field is an estimate of the average time an aircraft can expect to spend in the taxiway. Taxiways must have a length greater than 20 meters (65.6 feet).

4.6.1.8 Gates

A gate is a physical point of arrival and departure for an aircraft. For the purposes of dispersion modeling the emissions contributions due to GSE, AGE, and APUs are localized at the gate to which the aircraft is assigned. The gate *Coordinates* provide the spatial point in the coordinate system from which all the relevant GSE, AGE, and APU emissions are considered to emanate.

4.6.1.9 Configurations

It is recognized that airports operate under different configurations - the pattern of aircraft arrivals and departures on specific runways - over the course of a year depending on the direction and speed of the wind, capacity and noise abatement issues. Whereas it is impossible to account for all the various factors that might influence the definition of configurations at specific airports, it has been determined that most often configurations are defined based on the wind parameters of direction and speed.

The *Configurations* dialog (under the *Airport* menu heading) provides a way for the analyst to dynamically assign aircraft to different combinations of runways, queues and taxiways at dispersion run-time based upon wind parameters. For a specific configuration the *Wind Angle Range* specifies the range of wind directions under which the configuration is active. This range of wind angle ranges are mutually exclusive among configurations, i.e., any two configurations cannot have conflicting wind angle ranges. The *Maximum* (wind) *Speed* is a

value for the upper limit under which the configuration is still defined to be active. If at any particular weather hour a configuration is determined to be active due to the wind direction a wind speed that exceeds the *Maximum Speed* de-activates the configuration otherwise the configuration remains active for all aircraft that will be using configurations. For each configuration one *Runway* and up to three taxiways may be specified.

4.6.1.10 Aircraft Assignments

For each aircraft included in the study the *Aircraft Assignments* dialog box (under the *Airport* menu heading) allows the individual assignment of different runways, taxiways and gates. These assignments are necessary to determine the location of aircraft movement on the airport for dispersion analysis. If no assignments are made for an aircraft type then the dispersion contributions due to the relevant modes of aircraft operation will not be included in the final estimates.

The *Default Assignments* of *Runway* and up to three taxiways, will be valid at any given weather hour if either *the Use Configurations* box is not checked or if the *Use Configurations* box is checked and a valid configuration was not found. If the *Use Configurations* box is checked then the use of configurations takes precedence over the *Default Assignments*. The assignment of *Gate* is valid at all weather hours and dispersion will be calculated at the gate for any GSE, AGE, and APU assigned to the aircraft.

4.6.1.11 Discrete Receptors

The *Discrete Receptors* dialog box, found under the *Dispersion* menu heading, allows the user to place individual receptors in the EDMS coordinate system for concentration estimation. Dispersion calculations will include all receptors in the *In Study* list box. The EPA recommended height for receptor placement is breathing height around 1.8 meters or 5.9 feet. The receptor height is not to be used to model complex terrain or make adjustments otherwise. Please see section 4.4 for more information on receptor placement.

4.6.1.12 Grid Receptors

The *Grid Receptors* dialog box allows the user to define two dimensional grids of individual receptors over an area of the airport or study area. Due to the increased computational time required for a large number of receptors the primary use of grids has typically been in screening dispersion estimates. However EDMS can model an unlimited number of receptors and the user is constrained only by their hardware limits and processor speed. The *Grid Origin* and *Opposite Corner* coordinates define a rectangular grid of receptors with a spacing given by the *Receptor Spacing* value. The grid is created with receptors placed beginning at the grid origin point and ending at or closest possible to the opposite corner point. The receptor height is applied to all the receptors in the specified grid.

4.6.1.13 Meteorological Data

The *Meteorological Data* dialog box, under the *Dispersion* menu heading, allows the user to create their own weather records or to import actual weather data. The five weather parameters currently used by the EDMS dispersion modules are temperature, wind speed, wind direction, PG stability class, and mixing height. Of these the mixing height is subject to little change and is input once as a global parameter in the *Study Setup* dialog. The other four parameters may be specified in the dialog and a range of weather hours may be created with the valid range of values for the four parameters are as follows: *Temperature* 0 - 110 degrees Fahrenheit, *Wind Speed* 1 - 30 meters per second, *Wind Direction* 0 - 360 degrees (a wind coming out of the north has a direction of 0 or 360, a wind coming out of the east has a direction of 90), *PG Class* 1 (A) - 6 (F) (unstable to very stable). A very stable atmosphere

(PG class of 6) combined with a low wind speed (1 m/s) contribute to a worst case weather scenario. However, the direction of the wind is also extremely important in determining whether any pollutants are actually going to accumulate at the point or area of concern.

The user may use the *Import NCDC* button to import actual weather data (see section 5.2) and view the imported records in the dialog. Batch mode overwrites and individual record changes are permitted to any user created weather data, however only individual record changes are permitted to imported weather data. Individual weather records are created for unique hours in the course of a calendar year and are presented in the format *mm/dd/hh*, where m is the month, d is the day, and h is the hour. The EDMS treatment of hours in a day differs from military time in that the first hour of the day (between midnight and 1 a.m.) is hour 1 and not hour 0. EDMS assumes a non-leap year and hence there are 8760 hours in a year. EDMS also assumes that each year begins on a Monday (no matter which year is being modeled) for the purposes of simplification towards the creation and application of operational profiles.

Upon running dispersion the user is required to choose a weather file and unless otherwise specified all the weather records contained in the weather file are included in the dispersion control loop. In the model the outermost loop for dispersion calculations is weather records. In other words, the dispersion control algorithm sequentially steps through the selected weather records and for each one dispersion is calculated at receptors for all the sources included in the study.

4.6.1.14 Airport Graphical Display

The *Airport Graphical Display*, under the *View* menu, provides the analyst the capability to visualize their source and receptor placements in relation to each other. The legend provided at the top of the screen, along with the naming of individual sources identifies almost all the components. Runways are indicated by a thick gray line with a solid blue centerline, taxiways and queues are identified by a thin, gray line, roadways are indicated by a thin, solid red line and receptors are indicated by an asterisk (*). The *Airport Graphical Display* screen is a non-modal screen and hence the analyst may continue to add sources and receptors in dialogs and view their placement in the display upon closing each dialog. To further aid the analyst in verifying the coordinates and placement of components the position of the crossbar cursor, in the coordinate system, is displayed in the status bar at the bottom of the display screen, and a *Scale* is displayed in both the status bar and the legend. A limited zoom capability is provided.

4.6.2 Data Output

The dispersion calculations may be run by selecting *Run Dispersion* under the *Dispersion* menu heading. There is significant pre-processing related to aircraft activity that occurs before the actual dispersion algorithms are executed. These include the checking of runway and gate assignments to each aircraft type and the compilation of a composite GSE/AGE/APU emission rate for each aircraft type. Memory for all the dispersion modules is allocated dynamically and hence computers with less than eight megabytes of random access memory (RAM) may not be able to run dispersion.

As the dispersion algorithms execute, the *Dispersion Run Status* progress meter displays the *Estimated Time Remaining* and the weather hour being processed. The estimate for time to completion is based upon the time taken for the number of weather hours processed to that point and the number of weather hours remaining to completion. An *Abort Run* button allows the user to cancel the dispersion run if necessary. Upon completion a dialog will display the number of each source kind that dispersion was modeled for, the number of receptors at which concentrations were estimated, and the number of weather hours that dispersion was conducted for. The output, concentrations at receptors, may then be viewed,

and printed (in two different ways). These concentrations do not consider or include ambient concentrations.

4.6.2.1 View Concentrations

Concentrations at receptors for the most recent dispersion run may be viewed by selecting the *View Concentrations* screen under the *View* menu heading. The *Highest*, *Source*, and *Pollutant* drop-down lists enable the user to customize a *Query* of the output data. The output tables may potentially be very large and contain thousands of records and hence this query capability is useful to view the highest concentrations of a particular pollutant by source category contributions.

Concentrations for all pollutants, except PM-10, are listed in both micrograms per cubic meter ($\mu g/m^3$) and parts-per-million (PPM). The relation between PPM and $\mu g/m^3$ is expressed in the equation given below:

$$\mathbf{ppm_i = \mu g/m^3{}_i \,/\, (MW_i \times 40.91)}$$

Where:

ppm_i	-	parts-per-million by volume of pollutant *i*
$\mu g/m^3{}_i$	-	micrograms per cubic meter of pollutant *i*
MW_i	-	molecular weight of one molecule of pollutant *i*

Equation 4-2: Relationship Between PPM and $\mu g/m^3$

The *CO*, *NOx*, *SOx*, and *PM-10* pollutant categories are one hour averaged concentrations - raw output from the dispersion modules. The other averaged categories are generated by an averaging routine and in the case of a very large output table the averaging process may take up to several minutes. Averaged concentrations are generated and stored in tables either upon the first query request for an averaged concentration, or when the dispersion is generated. Averages are generated only for the categories that are listed in the Primary National Ambient Air Quality Standards and these are: the 8 hour CO average, the 24 hour SOx and PM-10 averages, and the Annual Arithmetic Mean (AAM) for NOx, SOx, and PM-10. Averages are computed as sliding average, for example, the 8 hour CO average at any given hour is the average of the concentration at that hour and that of the seven preceding hours. Hence, to generate the 8 hour average at least eight weather hours must have been run and to generate the AAM at least 8760 hours of weather data must have been run.

All the view displays may be printed by choosing *Print* option from the *File* menu heading. Printing in this case is WYSIWYG (What You See Is What You Get). *Printer Options* may have to be modified to enable complete printing of all the columns and rows.

4.6.2.2 Print Dispersion Report

The EDMS dispersion report may be printed from the *Print Dispersion Report* menu item under the *Reports* menu header. This report lists the time period for which dispersion was run, the number of receptors and different source kinds included in the run and the *Highest Five Concentrations In Each Standard.* These standards are the Primary National Ambient Air Quality Standards as listed in federal regulations (see 40 C.F.R. Part 50). Each high concentration is listed by its rank, the receptor (name and location) at which the concentration occurred, and the concentration in $\mu g/m^3$ (and PPM if applicable).

5. UTILITIES

5.1 Add Aircraft

In recognition of an analyst's need to include their own aircraft data (type, modes, and emission factors), the model provides a utility for the analyst to add aircraft to the EDMS system database tables.

The *Add Aircraft* dialog box is displayed under the *Utilities* menu heading. In this screen the user may specify an aircraft name, the number of engines on the airframe, the *Time In Mode* for the four modes and the *CO, HC, NOx*, and *SOx* emission factors in each of the four modes. Since PM-10 emission factors are generally not available for aircraft engines this field is not displayed. Please refer to Table 3-1 in section 3.1.1 for a listing of aircraft time-in-modes for various categories of aircraft. For user created aircraft the aircraft name is preceded by two asterisks (*) to indicate that it was user created and the available engine, assigned by the program, is the *DEFAULT* engine name.

Please note that user created aircraft included in a study for use on a different version or copy of EDMS will not be recognized as they will not be present in that copy's system database. However, the newly defined aircraft will be available for use in another study performed with the existing version of EDMS.

5.2 National Climatic Data Center (NCDC)

EDMS offers the capability to import up to a year's worth of hourly weather data from the NCDC's *WBAN Hourly Surface Observations TD-1440* format. The import utility may be run either by selecting *Load Weather Files* from the *Utilities* menu heading or from the *Meteorological Data* dialog box as explained in section 4.6.1.13.

TD-1440 files are presented in a FORTRAN style, 80 column, card-deck format. Each row of data represents a particular hour of weather observation and each column is punched for different weather data. EDMS reads in columns 1-5 (station number), 6-7 (year), 8-9 (month), 10-11 (day), 12-13 (hour), 14-16 (ceiling height), 17-20 (sky condition), 39-40 (wind direction), 41-42 (wind speed), and 47-49 (dry bulb temperature). EDMS will create a refined weather table that stores the specific hour (mm/dd/hh), the wind speed (in m/s), wind direction (0-360), and the PG stability class (1-6). The PG stability class is calculated using the specific hour in the year, the ceiling height, the sky condition, the wind speed, and the station latitude. This derivation is adapted from the PCRAMMET user's guide, Section 4.3 (Reference 8). For missing hours or corrupted hours of weather data the import utility adopts the previous hour's data as substitute data.

EDMS requires that weather files to be imported represent an entire calendar year. Missing or non-sequential files will cause the import function to terminate. TD-1440 weather data for weather stations throughout the United States, and some foreign stations, may be obtained by writing or calling: NCDC, 151 Patton Ave., Room 120, Asheville, NC 28801-5001, phone (704)271-4800.

5.3 Import and Export Operational Profiles

For analysts building accurate operational profiles (see section 6.1.2) for the purposes of dispersion modeling they may be interested in building these profiles off-line and importing them into the model. Or, they may be interested in building their profiles within EDMS and exporting them to use in a graphical chart or plot for graphical feedback of their source activity over time. For these reasons EDMS offers a utility module to export and/or import operational profiles.

The *Export/Import Operational Profiles* dialog is selected under the *Utilities* menu heading. The user selects radio buttons to specify the kind of profile file - *Hourly, Daily,* or *Monthly* and whether they would like to *Import* or *Export*. The user is then presented with a dialog to specify either the location of the file to be imported or the name and location of the file to be exported. The export/import format is the common ASCII-tab delimited format. Each field (including the profile name) is separated by a tab and each record is terminated with a carriage return. Errors in data to be imported will either terminate the import routine or individual records will be omitted in the import process.

5.4 EPA Models

5.4.1 MOBILE5a

MOBILE5a is the Environmental Protection Agency's tool used to estimate mobile source emissions of CO, VOCs, and NO_2. The program consists of a large database controlled by a FORTRAN program and calculates emission factors for eight vehicle types based on a number of variables such as calendar year, ambient temperature, average speed, the vehicle fleet mix, engine operating temperature at start-up, altitude of operation, specific inspection and maintenance plans, use of catalytic converters, etc.

MOBILE5a and supporting documentation may be obtained by writing or calling the EPA at: US EPA, Office of Mobile Sources, 2565 Plymouth Road, Ann Arbor, MI 48105; Ph: (313)668-4285 or it may be downloaded from the EPA CHIEF bulletin board/website at: http://134.67.104.12/html/ttnbbs.htm

5.4.2 PART5

PART5 is the Environmental Protection Agency's tool used to estimate mobile source emissions of particulate matter (PM, PM-10) and SO_2. Its makeup and use are very similar to the MOBILE5a tool.

6. MENU AND OPTIONS

This section includes the EDMS on-line help.

6.1 The File Menu

- Setup
- Operational Profiles
- Hourly Operational Profiles
- Daily Operational Profiles
- Monthly Operational Profiles
- New Study
- Open Study
- Close Study
- Save Study As
- Delete Study
- Print
- Print Preview
- Print Setup

6.1.1 Setup

Study Setup Window

The Study Setup window (Figure 6-1) allows you to setup a study by specifying several important parameters. Some of these parameters (altitude, temperature, and year) are utilized in calculating the vehicle, roadway, and parking lot *emissions inventory* and in performing *dispersion analysis*. In addition to providing modifiable default airport data for the study airport, the Study Setup Window allows you to select the *Airport Layout Units* (Metric or English units), specify the *Vehicle Fleet Year* (1988 to 2010), and enter a short description of the study in the *Study Information* field. EDMS automatically assigns a Date Created for each new study.

To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding Study Information

Study information is based on the characteristics of the specific airport (or projected airport) you are modeling. If the airport currently exists, choose the 3-character airport designator from the Select Airport drop down menu. Information such as *Airport Name*, *State*, *Elevation*, *Latitude*, *Longitude*, *Mixing Height*, *Average Yearly Temperature*, and *Vehicle Fleet Year* will be displayed for the selected airport.

The current Mixing Height and Average Yearly Temperature fields contain default data which are not specific to the airport you have selected. In addition, if a non-US airport is selected, the state defaults to "Z" and the airport elevation defaults to zero.

Editing Study Information

Enter the appropriate data in the above mentioned fields. *Mixing Height* will affect *Aircraft Time in Mode*. Average Yearly Temperature will affect *Vehicle Emission Factors*.

When you have completed specifying airport information, press OK. To leave this window without implementing changes, press Cancel.

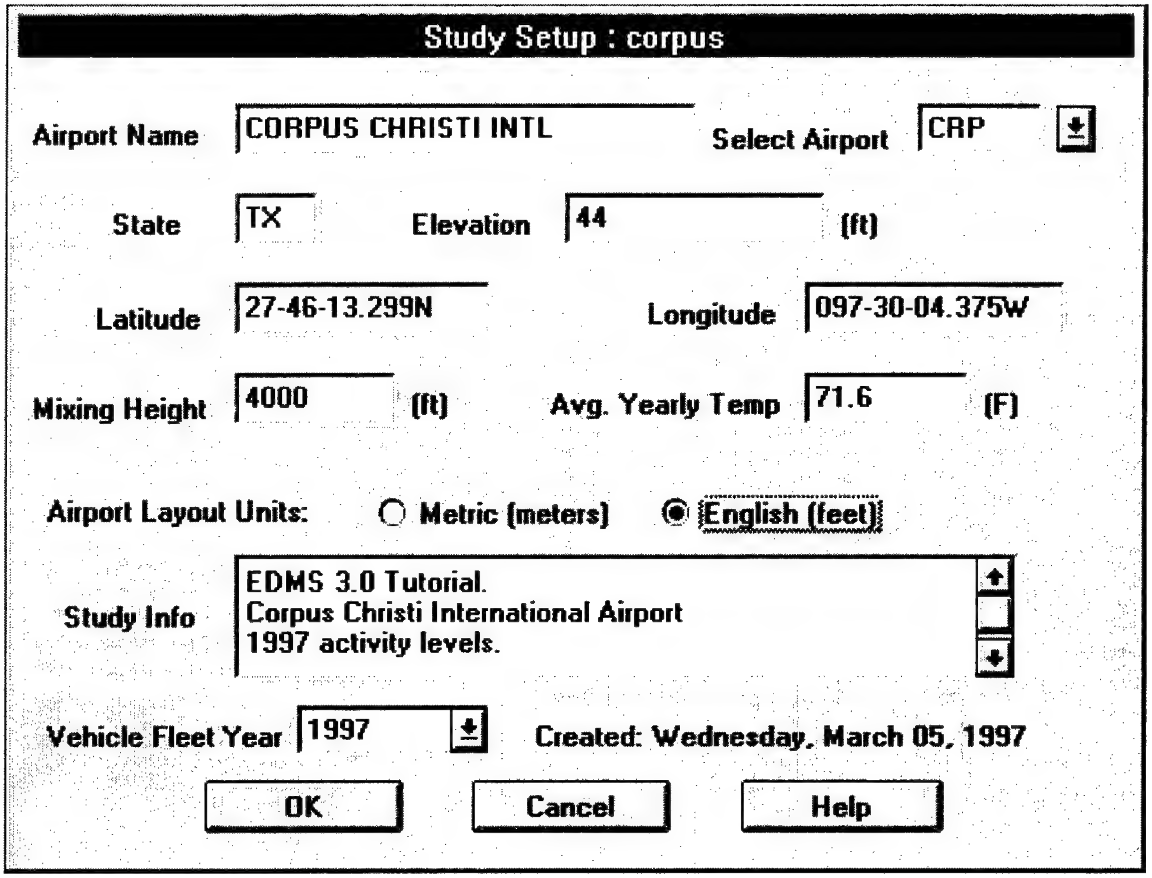


Figure 6-1: The Study Setup Window

6.1.2 Operational Profiles

Source Strength Variation

In all the widely accepted dispersion *models*, dispersion is calculated for one hour periods, and EDMS 3.0 is no exception. However all source types can be expected to vary hour by hour in their activity or strength. For example, for the afternoon hours on a busy weekday a certain roadway may experience a high volume of traffic. Whereas for early morning hours on a weekend day the same roadway may experience very little or no traffic. Operational profiles are hence used to profile the activity/strength of any source over the course of an entire year (8760 hours) hour by hour in a manner that provides accuracy yet eliminates a brute force approach of providing the actual activity/strength for each hour of the year.

Methodology

Operational profiles are based on the concept of peak activity. A peak *hour*, *day*, or *month* is defined as the hour, day, or month at which the most or maximum activity occurs. There can be one or more such peaks among the hours in a 24 hour period, among the days in a seven day period, and among the months in a twelve month year. Peak activity (no matter how high or low in real figures) is always represented by a 1 (signifying maximum activity) and anything other than a peak is represented as a percentage of that activity in a number between zero and one. This concept of operational profiles, based on peak activity, requires that there be at least one identified peak, in each of the hour, day and month categories.

Dispersion Calculation

At run time, for each hour, the source activity/strength is modified by multiplying it by the three factors that represent that particular hour in the sequence of 8760 hours in a year

(hour 1 being the first hour of January 1 and hour 8760 being the 24th hour of December 31). Dispersion is then calculated based on this modified source activity/strength.

$$S_i = S_p \times HF_i \times DF_i \times MF_i$$

Where:

i is a specific hour in the sequence of 8760 hours in a year
S_i is the source strength at hour i
S_p is the source strength at peak hour
HF_i is the factor for the hour (1-24) in which the hour i falls
DF_i is the factor for the day (Mon - Sun) in which the hour i falls
MF_i is the factor for the month (Jan - Dec) in which the hour i falls

Example: Consider a source emitting 100 kg, at peak hour. Hour # 46 corresponds to the 22nd hour on January 2nd (a Tuesday). Say that the factor in the hourly profiles for the 22nd hour is 0.7, the factor in the daily profiles for Tuesday is 0.9, and the factor in the monthly profiles for January is 0.6. Then the source strength at hour # 46 is given by:

$$\begin{aligned} \text{Strength}_{46} &= 100 \text{ kg (peak hr strength)} \times 0.7 \times 0.9 \times 0.6 \\ &= 37.8 \text{ kg} \end{aligned}$$

Relation Between Peak Hour Activity and Annual Activity

For each source the user is required to specify either a peak activity or an annual activity and then operational profiles in each of the three categories (hourly, daily, monthly.)

If peak activity is specified then the yearly activity is modified based on the following formula:

Annual Activity = Peak Hour Activity x 8760 x month factor avg x day factor avg x hour factor avg

If yearly activity is specified then the peak hour activity is modified based on the following formula:

Peak Hour Activity = Annual Activity / 8760 / month factor avg / day factor avg / hour factor avg

The factor averages are simply averages of the respective factors in each category. The above approach ensures that the peak activity and the annual activity are always reflective of each other based on the specified operational profiles.

6.1.3 Hourly Operational Profiles

The Hourly Operational Profiles Window

The Hourly *Operational Profiles* window (Figure 6-2) allows you to specify the proportion of *operations* at *peak hour* that take place in each of the 24 hours in a given day. This proportion is expressed as any real number between 0 and 1 such that 0 is equal to 0% and 1 is equal to 100%.

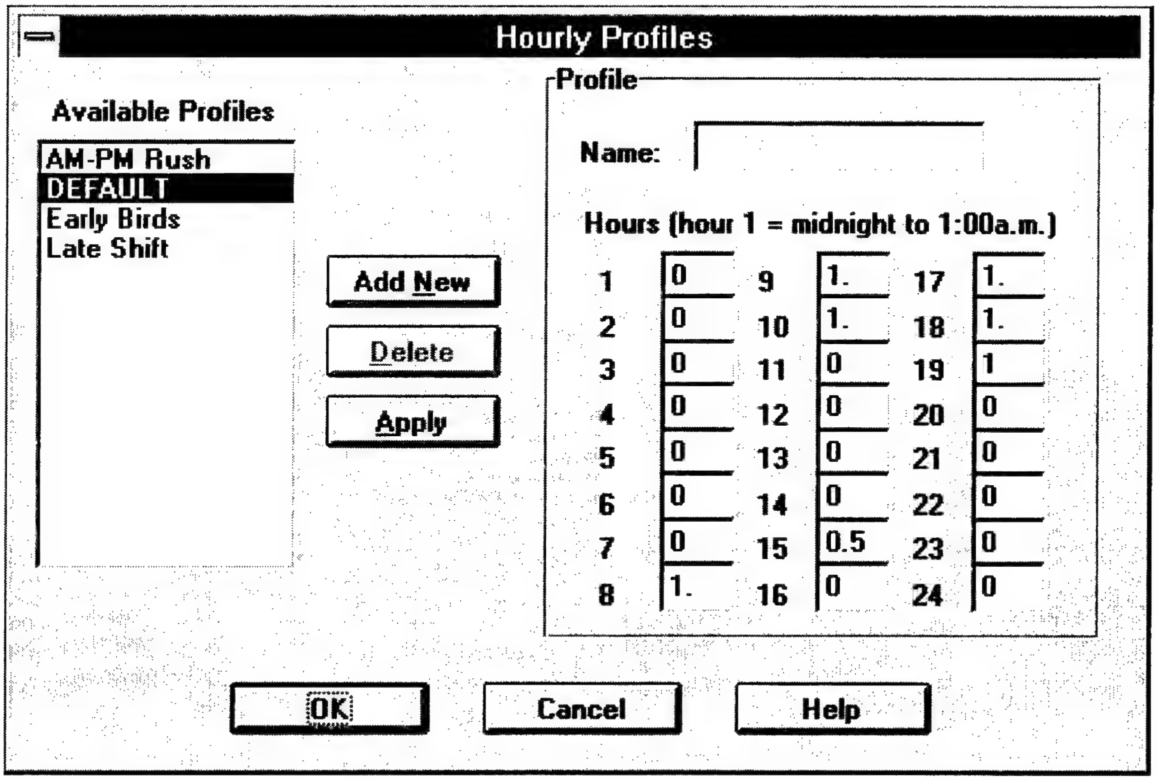


Figure 6-2: The Hourly Operational Profiles Window

For example the peak hour operations for an aircraft in a 24-hour period could be 10, and that same 24-hour period might have a total of 6 hours that experience the peak number of operations. Those 6 hours might be 7-8, 8-9, and 9-10 a.m., and 4-5, 5-6, and 6-7 p.m. The hourly profile would have a 1 in the fields for hours 8, 9, 10, 17, 18, and 19 signifying that those hours experienced the maximum number of operations in an hour. Other hours experiencing fewer than the peak number of operations would express those operations as a proportion of the maximum (1). For example, an hour (say 2-3 p.m.) experiencing 5 operations would be expressed as .5 in hour 15 of the hourly operational profile. Note: Since the hourly distribution is expressed as a proportion of a peak hour figure (1), at least one of the 24 hours must have a peak hour designation of 1.

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding Hourly Operational Profiles

To add a new hourly profile, press Add New, type in a name for the new profile in the Name field, and type in the proportion for each of the 24 hours. Once added, a new hourly profile becomes available for selection in other EDMS modules under Operational Profiles.

Editing Hourly Operational Profiles

To remove a profile from the list of available profiles, select the profile name and press Delete. If you modify an existing hourly operational profile that is in use in other EDMS modules, you must reselect that profile in each of the modules to record the modifications. Note: the Default profile can be modified, but cannot be deleted.

6.1.4 Daily Operational Profiles

The Daily Operational Profiles Window

The Daily *Operational Profiles* window (Figure 6-3) allows you to specify the proportion of *peak day operations* that take place in each of the 7 days in a given week. This proportion is expressed as any real number between 0 and 1 such that 0 is equal to 0% and 1 is equal to 100%.

For example the peak day operations for an aircraft could be 100, and there might be 3 days in a given week that typically experience the peak number of operations. Those 3 days might be Monday, Tuesday, and Friday. The daily profile would have a 1 in the fields for Monday, Tuesday, and Friday signifying that those days experienced the maximum number of operations in a week. Other days experiencing fewer than the peak number of operations would express those operations as a proportion of the maximum. For example, a day (say Thursday) experiencing 70 operations would be expressed as .7 on Thursday in the daily operational profile. Note: Since the weekly distribution is expressed as a proportion of a peak day figure (1), at least one of the 7 days must have a peak day designation of 1.

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

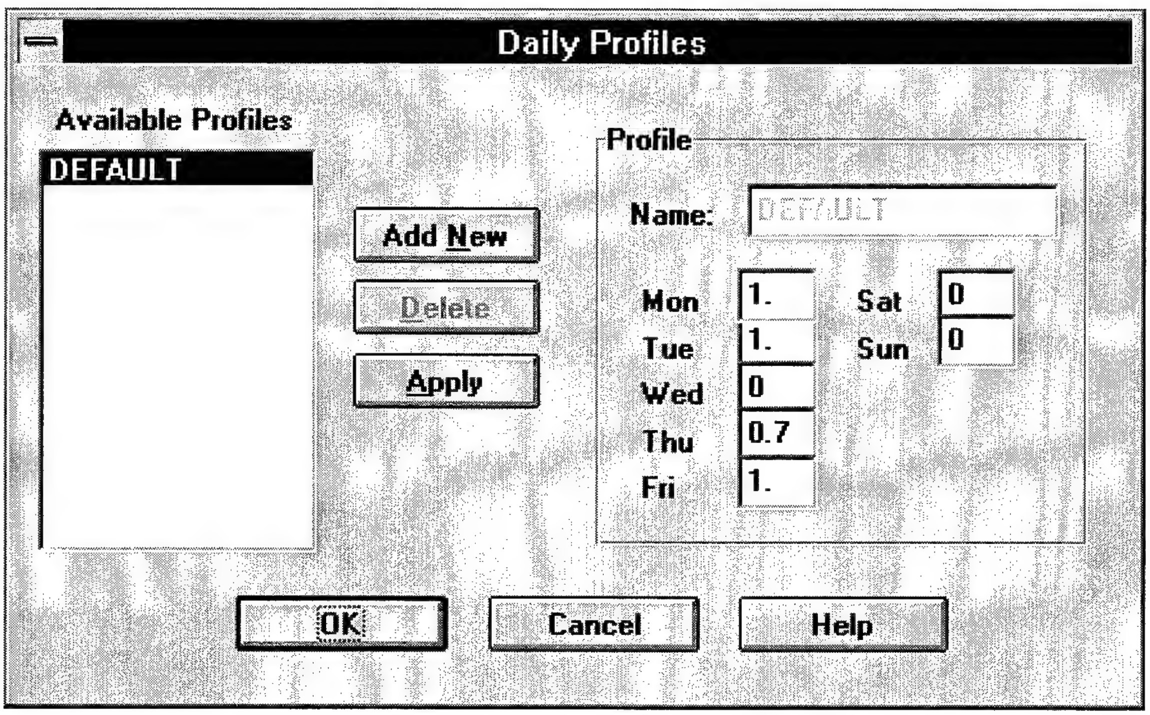


Figure 6-3: The Daily Operational Profiles Window

Adding Daily Operational Profiles

To add a new daily profile, press Add New, type in a name for the new profile in the Name field, and type in the proportion for each of the 7 days. Once added, a new daily profile becomes available for selection in other EDMS modules under Operational Profiles.

Editing Daily Operational Profiles

To remove a profile from the list of available profiles, select the profile name and press Delete. If you modify an existing daily operational profile that is in use in other EDMS modules, you must reselect that profile in each of the modules to record the modifications. Note: the Default profile can be modified, but cannot be deleted.

6.1.5 Monthly Operational Profiles

The Monthly Operational Profiles Window

The Monthly *Operational Profiles* window (Figure 6-4) allows you to specify the proportion of *peak month operations* that take place in each of the 12 months in a given year. This proportion is expressed as any real number between 0 and 1 such that 0 is equal to 0% and 1 is equal to 100%.

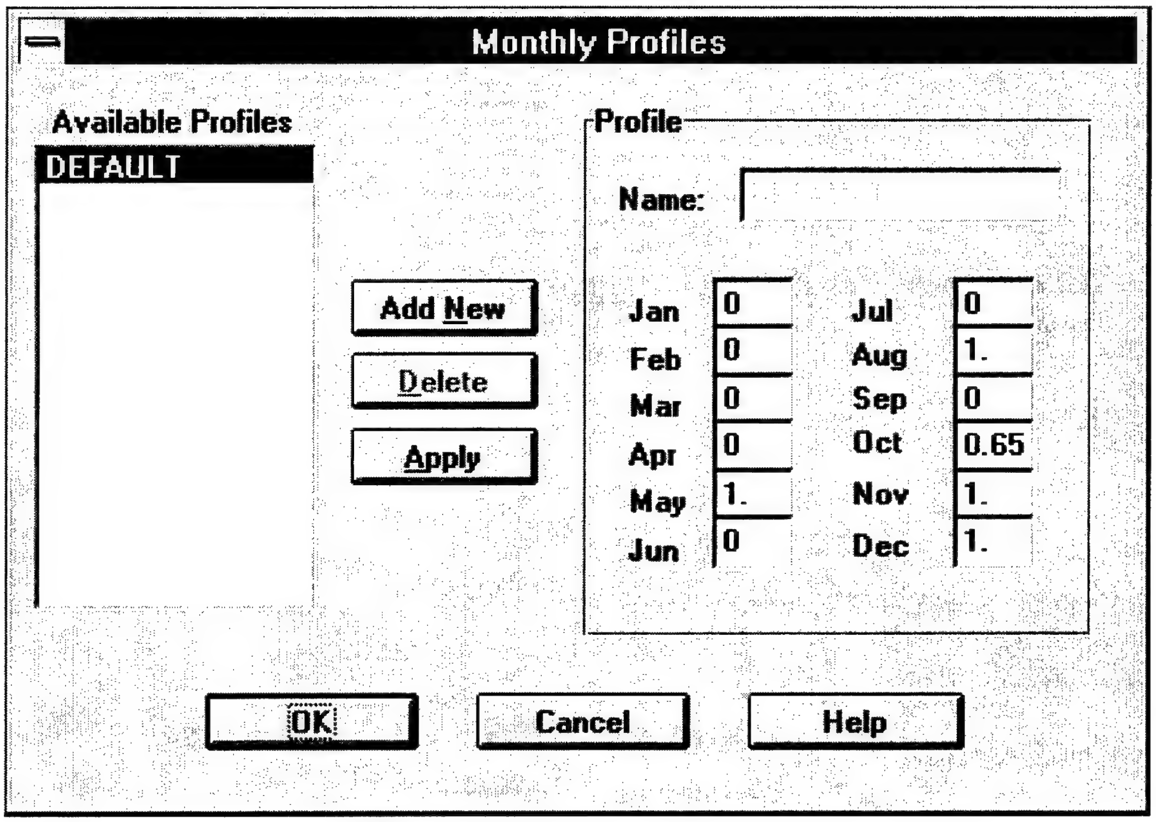


Figure 6-4: The Monthly Operational Profiles Window

For example the peak month operations for an aircraft could be 1000, and there might be 4 months in a given year that typically experience the peak number of operations. Those 4 months might be May, August, November, and December. The monthly profile would have a 1 in the fields May, August, November, and December signifying that those months experienced the maximum number of operations in a month. Other months experiencing fewer than the peak number of operations would express those operations as a proportion of the maximum. For example, a month (say October) experiencing 650 operations would be expressed as .65 for October in the monthly operational profile. Note: Since the monthly distribution is expressed as a proportion of a peak month figure, at least one of the 12 months must have a peak day designation of 1.

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding Monthly Operational Profiles

To add a new monthly profile, press Add New, type in a name for the new profile in the Name field, and type in the proportion for each of the 12 months. Once added, a new monthly profile becomes available for selection in other EDMS modules under Operational Profiles.

Editing Monthly Operational Profiles

To remove a profile from the list of available profiles, select the profile name and press Delete. If you modify an existing monthly operational profile that is in use in other EDMS modules, you must reselect that profile in each of the modules to record the modifications. Note: the Default profile can be modified, but cannot be deleted.

6.1.6 New Study

To create a new study, select File/New Study from the pulldown menu. When the New Study dialog window appears, type in the name of your study (8 character limit) in the study name field. Then, scroll through the list of directories in the new study dialog window and choose the location where the new study will be created. To create the new study press OK. To exit this window without creating a new study, press Cancel. Note: EDMS will store all user tables in the directory when the study has been created.

6.1.7 Open Study

To open an existing study, select File/Open Study from the pulldown menu. When the Open Study dialog window appears, locate the study (with **.edm** extension) in the directory or drive in which it has been stored, select the study name, and press OK. To exit the Open Study window without opening a study, press Cancel.

6.1.8 Close Study

To close a study, select File/Close Study from the pulldown menu.

6.1.9 Save Study As

To save a copy of the current study under another name, select File/Save Study As from the pulldown menu. When the Save Study As dialog window appears, type the name you wish to save the study as, choose a directory and drive, and press OK. To exit this window without saving, press Cancel.

6.1.10 Delete Study

To delete an open study, select File/Delete Study from the pulldown menu. To delete a previously saved study, first open the study using the File/Open pulldown menu, then select File/Delete Study from the pulldown menu.

6.1.11 Print

The Print option is available for the following EDMS modules: View/Airport, View/Emissions Inventory, View/Concentrations, and View System Tables.

With any of the View modules displayed, select File/Print from the pulldown menu. When the Print dialog window appears, you will be able to select the print range, number of copies,

and printer setup. When you are ready to print, press OK. To leave this window without printing, press Cancel.

With the Reports modules, printing commences to the specified default printer as soon as Print Emissions Reports or Print Dispersion Reports is selected. To change the default printer or page setup, select File/*Print Setup* from the pulldown menu.

6.1.12 Print Preview

The Print Preview option is available for the following EDMS modules: View/Airport, View/Emissions Inventory, View/Concentrations, View System Tables.

With any of the View modules displayed, select File/Print Preview from the pulldown menu. When the Preview dialog window appears, you will have a variety of pushbutton viewing options to choose from, including zoom, multi-page viewing, and printing. To print the document, press Print. To leave this window without printing, press Close.

6.1.13 Print Setup

The Print Setup option under the File pulldown menu allows you to specify a printer other than the default printer, and to set other print parameters such as page orientation, and paper size and source. To specify a non-default printer, use the drop down menu to select the new printer. Use the radio buttons to select the paper orientation (portrait or landscape). To change the paper size and paper source, use the drop down menu and choose from the list. Additional printer setup features are available by pressing the Option button. When you have completed the print setup operations, press OK. To exit the Print Setup window and return to the previously saved setup, press Cancel.

6.2 The Emissions Menu

- Aircraft Activity/LTO Cycles
- Aircraft GSE/APU & Assignments
- Parking Lots
- Roadways
- Edit Emission Factors
- Stationary Sources
- Training Fires
- Run Emissions Inventory

6.2.1 Aircraft Activity/LTO Cycles

Aircraft Activity/LTO Cycles Window

The Aircraft Activity/LTO Cycles window (Figure 6-5) allows you to choose from a list of *Available Aircraft* types and *Engine Types* to be included in your study. Once selected, you can specify *Operational Profiles* and *Aircraft Operations* parameters for each airframe/engine configuration. Together, these fields allow for a high level of precision in specifying airframe/engine and operational configurations for a given airport.

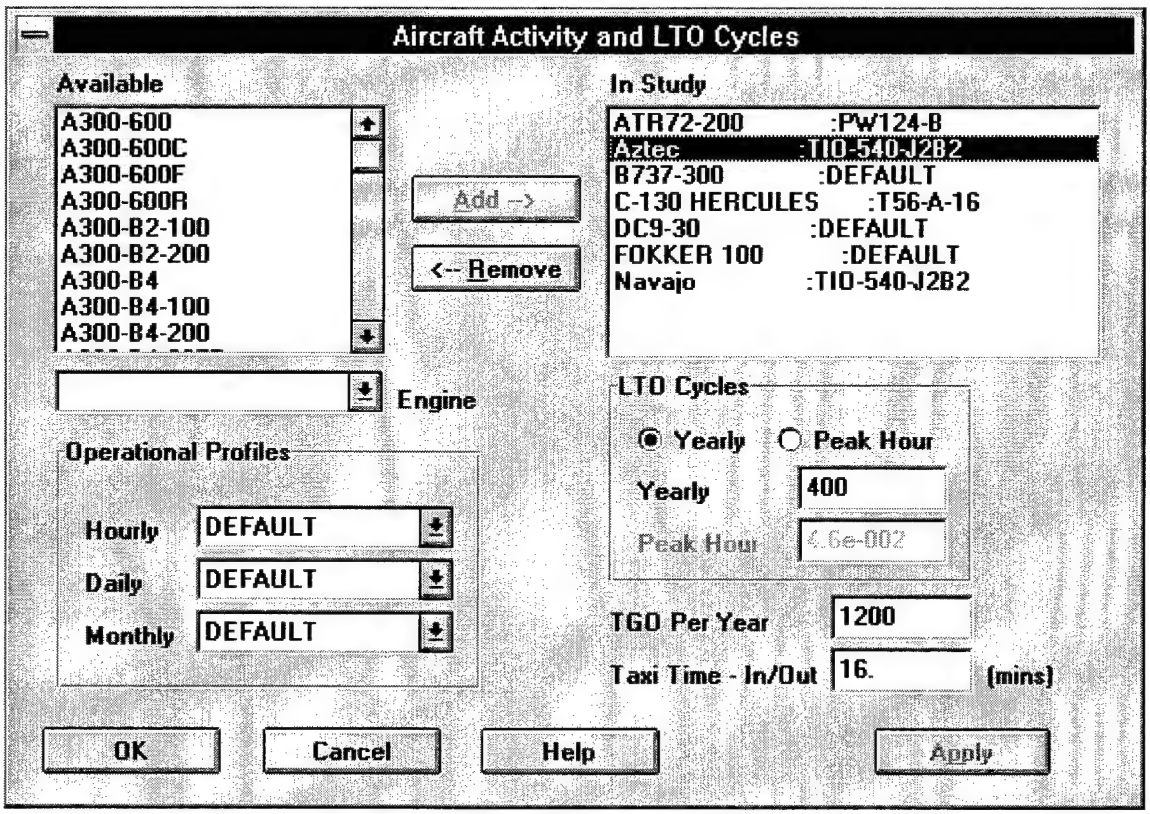


Figure 6-5: The Aircraft Activity/LTO Cycles Window

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding Aircraft

To construct the aircraft types to be used in your study, you will need to select an airframe and engine type. First, choose from the list of available airframes. Once you have chosen an airframe but before pressing Add, select an engine type from the engine drop down menu or

utilize the *Default Engine*. The engine types listed are those currently utilized with the airframe you have chosen. When you have selected the appropriate engine type, press Add.

Editing Aircraft
To remove an aircraft type previously added, select the aircraft type and press Remove.

LTO Operations
Under *LTO Cycles*, you can choose between *Yearly* and *Peak Hour* Landing and Takeoff (LTO) cycles depending on what data are available.

The emissions inventory relies on the Yearly LTO cycle information. If you know the yearly LTO cycles figure, press the Yearly button and enter the number. If you do not have a yearly LTO cycles figure, you can derive it by providing a peak hour figure and choosing operational profiles that accurately describe the activity.

Calculation of dispersion relies on Peak Hour LTO cycles. If you know the peak hour LTO cycle figure, press the Peak Hour button and enter the number. If you do not have a peak hour operations figure, you can derive it by providing a yearly LTO cycles figure and choosing operational profiles that accurately describe the aircraft activity.

If *Touch and Go* (TGO) operations are relevant to your study, enter the number in the TGO per Year box.

Taxi Time (total) information can also be entered for each aircraft type (a default figure is automatically displayed).

Operational Profiles
Modifications to Operational Profiles default settings may be made at the *Hourly*, *Daily*, or *Monthly* levels. However, the modifications are made and named using the *Operational Profiles* dialogs (hourly, daily, monthly) under the File pulldown menu. Once modifications have been made, the new name will appear under the appropriate drop down menu and may be selected. Please note that changes to the hourly, daily, or monthly operational profiles will affect the operational figures.

6.2.2 Aircraft GSE/AGE & APU Assignments

The GSE/AGE & APU Assignments Window
The GSE/AGE and APU Assignments window (Figure 6-6) allows you to specify the *Ground Support Equipment* (GSE)/*Aerospace Ground Equipment* (AGE), and *Auxiliary Power Units* (APUs) associated with each *aircraft type* used in the study. GSE/AGE and APU emissions data are utilized in EDMS emissions and dispersion analyses. For emissions purposes, GSE/AGE and APU assignments are made to specific aircraft types and have an operational duration (Operation Time/LTO) associated with each *aircraft type*. For dispersion analyses, GSE/AGE and APU emissions are treated as *point sources* by EDMS. GSE/AGE and APU emissions sources are located spatially via assignment of aircraft to specific *gates*.

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

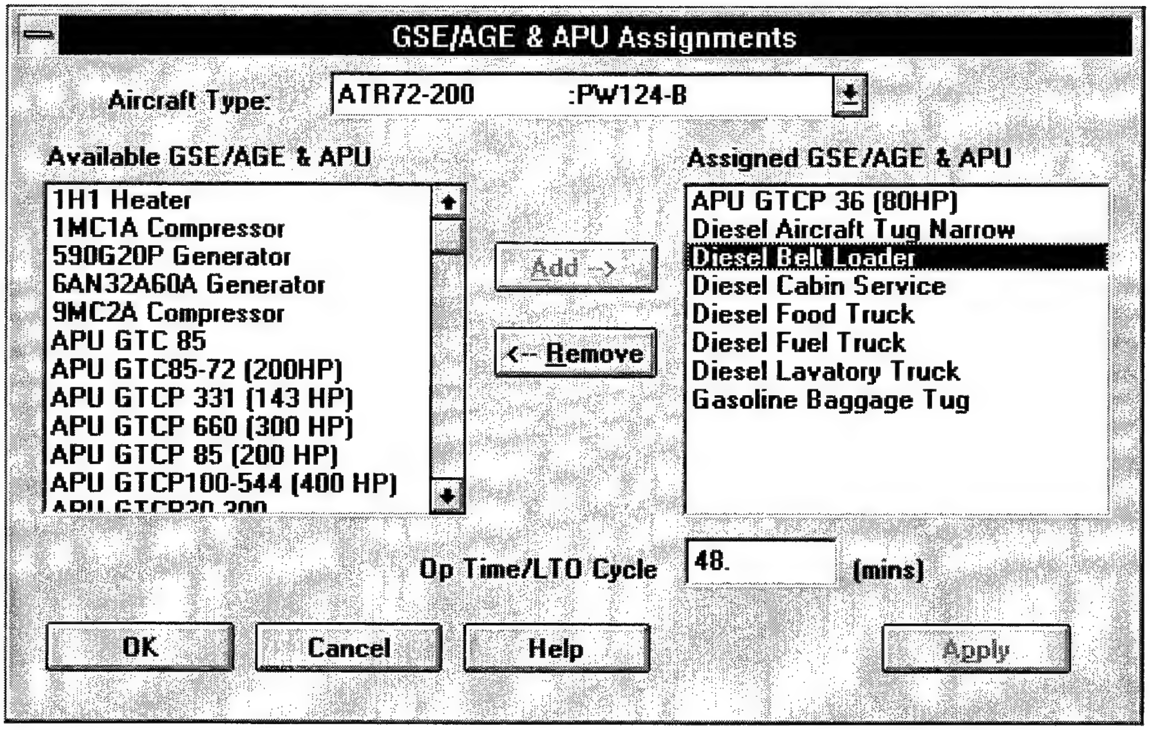


Figure 6-6: The Aircraft GSE/AGE & APU Assignments Window

Adding GSE/AGE & APU Assignments

When you select an aircraft type from the drop down menu, a list of available GSE/AGE & APU types will appear in the Available GSE/AGE & APU field. In addition, a list of GSE/AGE & APU types typically assigned to the selected aircraft type will appear in the Assigned GSE/AGE & APU field.

To move a GSE/AGE or APU type from the Available list to the Assigned list, select the GSE/AGE or APU type and press Add.

Editing GSE/AGE & APU Assignments

To move a GSE/AGE or APU type from Assigned back to Available, select the GSE/AGE or APU type name and press Remove.

For each assigned GSE/AGE & APU type, you can utilize the default Operation Time/(LTO Cycle) or specify a new figure. To modify a default time, simply select the displayed figure and then type in the new time.

6.2.3 Parking Lots

The Parking Lots Window

The Parking Lots window (Figure 6-7) allows you to specify the parking lot information relevant to your study. Parking Lot data are used by EDMS in both emissions and dispersion analyses. For emissions purposes, calculations are based upon the Number of Vehicles in each lot, as well as the Speed in Lot, Average Idle Time, and Average Distance Traveled in Lot for those vehicles. For dispersion analyses, Parking Lot emissions are treated as *area sources* by EDMS. Parking Lot emissions are located spatially within the airport using the x,y *coordinates*, and are described dimensionally as width (along x axis), length (along y axis), and height.

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

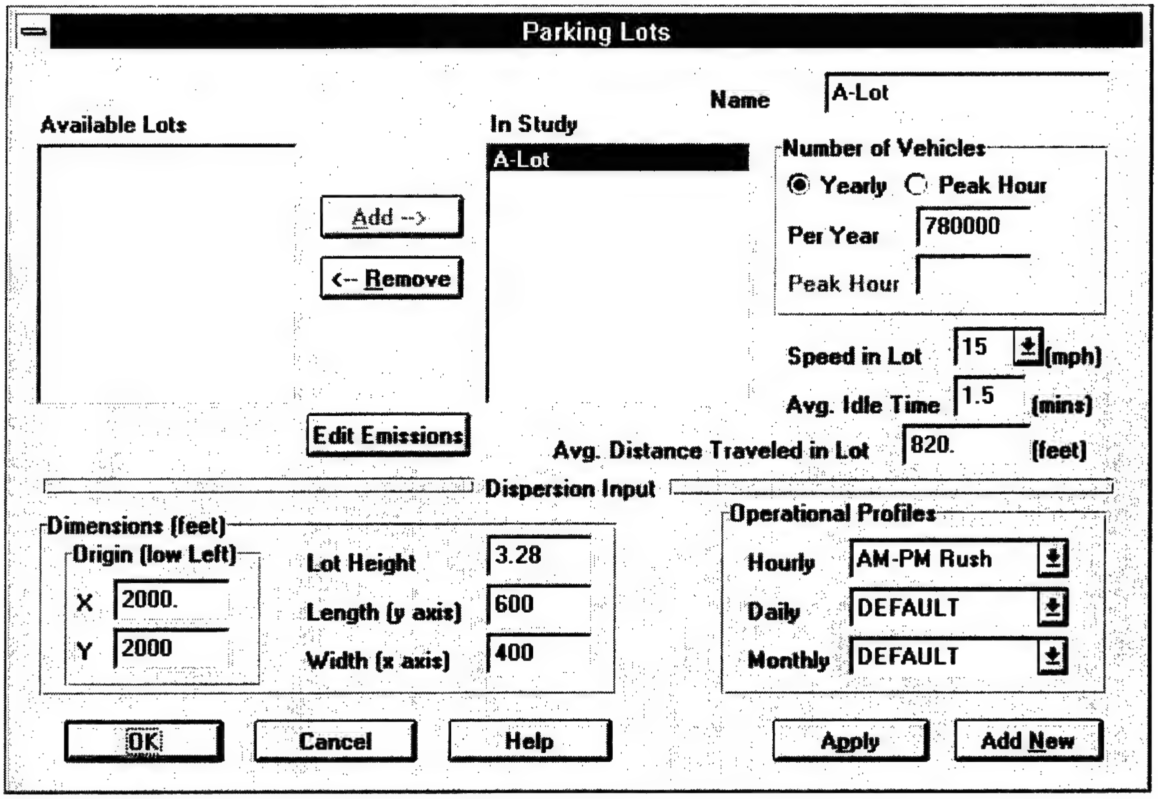


Figure 6-7: The Parking Lots Window

Adding Parking Lot Information

To add a parking lot, press the Add New button at the bottom of the window and type in the parking lot name. Once added, parking lots can remain in the current study, or be moved to a list of available lots.

Once you have added a parking lot to your study, additional information will be required depending on whether you are conducting an emissions or dispersion analysis. Emissions information such as number of vehicles, speed, idle time, and distance traveled are located in the top half of the window. Dispersion information including coordinates, lot height, length, width, and *operational profiles* are located in the lower half of the window.

Editing Parking Lot Information

To move a parking lot from In Study to Available, select the parking lot name and press Remove. To move a parking lot from the Available list to the In Study list, select the parking lot name and press Add.

Most fields may be edited by simply selecting the field and typing in the new information. *Yearly* and *Peak Hour* figures are activated using the radio buttons and then modified by typing in the new information in the text fields. Speed in Lot and Operational Profiles are modified using the drop down menus.

Emissions

An emissions study requires you to provide specific information on Number of Vehicles, Speed in Lot, Average Idle Time, and Average Distance Traveled.

Number of Vehicles is expressed either in yearly operations or peak hour operations. The *emissions inventory* relies on yearly operations. If you know the *yearly operations* figure, press the Yearly button and enter the number. If you do not have a yearly operations figure, you can derive it by providing a peak hour operations figure and choosing operational profiles that accurately describe the distribution of vehicle activity.

Vehicle emissions figures are a function of average speed in lot, average idle time, and average distance traveled (as well as altitude, temperature, and year as entered in the Setup window).

Specify the average speed for vehicles traveling in the parking lot by selecting from the drop down menu.

Specify the average idle time in minutes and the average distance a vehicle would be expected to travel in the lot by typing the information into the appropriate field.

Finally, the *Edit Emissions* button allows you to use more specific information for vehicle emissions characteristics rather than the *MOBILE5a* and *PART5* figures. To modify the MOBILE5a figures, press the edit emissions button, type in the new figures and press Apply.

Dispersion
The *dispersion analysis* relies on *Peak Hour* operations. If you know the peak hour operations figure, press the Peak Hour button and enter the number. If you do not have a peak hour operations figure, you can derive it by providing a yearly operations figure and choosing operational profiles that accurately describe the distribution of vehicle activity.

In addition, performing a dispersion analysis requires you to specify dimensions of the parking lot and its *Operational Profiles*.

The parking lot dimensions fields locate the parking lot spatially in your airport configuration and provide information on parking lot width and height. Type in the (x,y) *coordinates* for the parking lot, as well as the parking lot height, length, and width. The (x,y) coordinates specify a lower left coordinate of the parking lot based on a length applied in the positive y direction and a width applied in the positive x direction.

Operational Profiles
Modifications to Operational Profiles default settings may be made at the *Hourly*, *Daily*, or *Monthly* levels. These modifications are made and named using the *Operational Profiles* window under the File pulldown menu. Once modifications have been made, the new name will appear under the appropriate drop down menu and may be selected. Please note that modifications to any one of the hourly, daily, or monthly default settings will affect the operational figures.

Graphical Display
Parking lots that are part of the In Study list are displayed in the *Airport Graphical Display*. Parking lots in the Available list are not displayed.

6.2.4 Roadways

The Roadways Window
The Roadways window (Figure 6-8) allows you to specify the roadway information relevant to your study. Roadways data are used by EDMS in both emissions and dispersion analyses. For emissions purposes, calculations are based upon the Number of Vehicles on the roadway, as well as the Speed and Roadway Length for those vehicles. For dispersion analyses, Roadway emissions are treated as *line sources* by EDMS. Roadway emissions sources are located spatially within the airport using the x,y *coordinates*, and take into account roadway Type (elevation) and Terrain Roughness.

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding a Roadway
To add a roadway, press the Add New, button at the bottom of the window and type in the roadway name. Once added, roadways can remain in the current study, or be moved to a list of available roadways.

Once you have added a roadway to your study, additional information will be required depending on whether you are conducting an emissions or dispersion analysis. Emissions information such as vehicle activity and roadway length are located in the top half of the window. Dispersion information including coordinates, roadway type, terrain characteristics, and operational profiles are located in the lower half of the window.

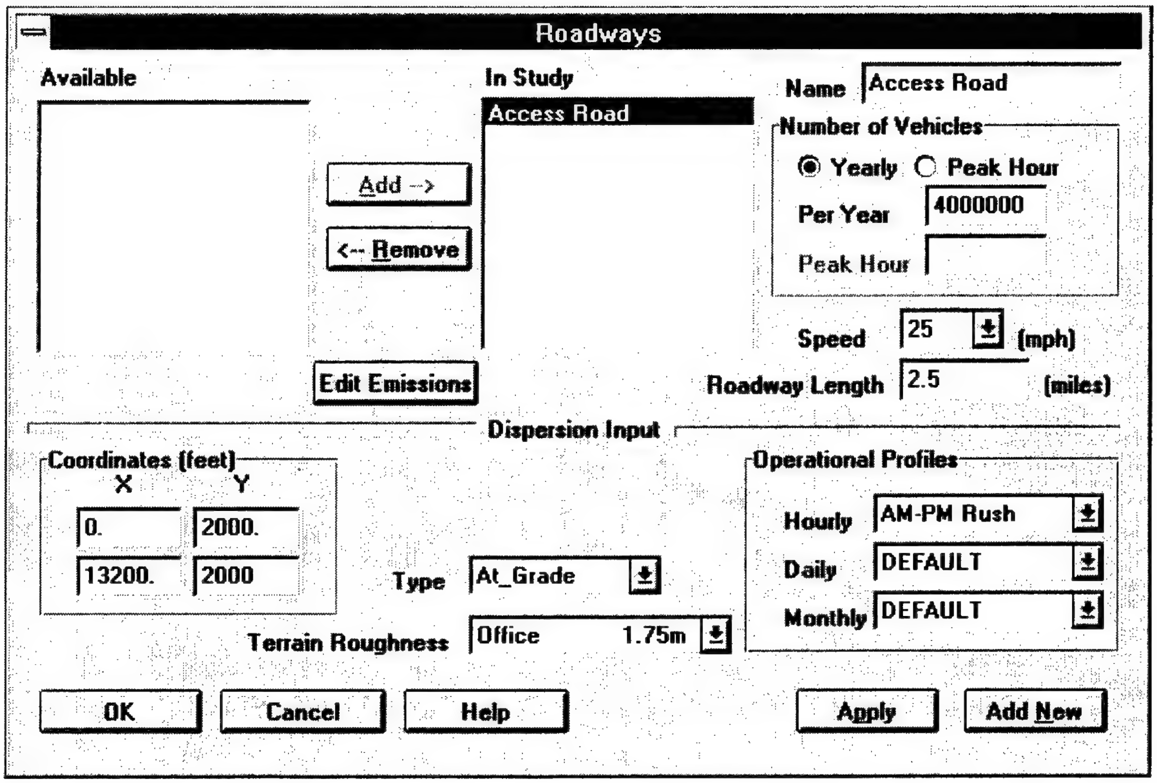


Figure 6-8: The Roadways Window

Editing a Roadway

To move a roadway from In Study to Available, select the roadway name and press Remove. To move a roadway from the Available list to the In Study list, select the roadway name and press Add.

Emissions

An emissions study requires you to provide specific information on Number of Vehicles, Speed, and Roadway Length.

Number of Vehicles is expressed either in *yearly operations* or peak hour operations. The *emissions inventory* relies on yearly operations. If you know the yearly operations figure, press the Yearly button and enter the number. If you do not have a yearly operations figure, you can derive it by providing a peak hour operations figure and choosing operational profiles that accurately describe the distribution of roadway activity.

Vehicle emissions are a function of average speed (as well as altitude, temperature, and vehicle fleet year as entered in the Setup window). Specify the average speed for the roadway by selecting from the drop down menu.

Roadway Length is utilized in emissions calculations. Specify the length of the roadway in the roadway length text field.

Note: Roadway length can also be specified using the coordinates fields under dispersion input.

Finally, the *Edit Emissions* button allows you to use more specific information for vehicle emissions characteristics rather than the *MOBILE5a* and *PART5* figures. To modify the MOBILE5a figures, press the edit emissions button and type in the new figures.

Dispersion
The *dispersion analysis* relies on *Peak Hour* operations. If you know the peak hour operations figure, press the Peak Hour button and enter the number. If you do not have a peak hour operations figure, you can derive it by providing a yearly operations figure and choosing operational profiles that accurately describe the distribution of roadway activity.

In addition, performing a dispersion analysis requires you to specify Coordinates, Type, Terrain Roughness, and Operational Profiles.

The roadway coordinates locate the roadway spatially in your airport configuration and provide information on roadway dimensions. Type in the (x,y) *coordinates* for the roadway in the coordinates text fields.

Information on type of roadway refers to a generalized height figure. Using the drop down menu, choose the type (Grade, Bridge, Depressed, or Fill) that best describes the roadway.

Information on terrain roughness refers to the quality of terrain surrounding the roadway. Using the drop down menu, choose the type (sand, grass, corn field, etc.) that best describes the surrounding terrain.

Operational Profiles
Modifications to Operational Profiles default settings may be made at the *Hourly*, *Daily*, or *Monthly* levels. However, the modifications are made and named using the *Operational Profiles* window under the File pulldown menu. Once modifications have been made, the new name will appear under the appropriate drop down menu and may be selected. Please note that modifications to any one of the hourly, daily, or monthly default settings will affect the operational figures.

Graphical Display
Roadways that are part of the In Study list are displayed in the *Airport Graphical Display (View/Airport)*. Roadways in the Available list are not displayed.

6.2.5 Edit Emission Factors

Edit Emission Factors
EDMS vehicle *emission factors* are derived from a large set of *MOBILE5a* and *PART5* runs. This data set forms the basis for deriving the vehicle emission factors for *Roadways* and *Parking Lots*. While this data set is highly representative of the vehicle population, you may wish to edit the emission factors in the Parking Lots or Roadways dialog windows to more accurately reflect conditions for a given study.

Edit Parking Lots Emission Factors
To edit the Parking Lot emission factors, click on the parking lot name and press the Edit Emissions button. The Edit Emissions dialog window will appear displaying the emissions factors (in grams per vehicle) for *CO*, *HC*, *NOx*, *SOx*, and *PM-10*, as calculated by EDMS based on the Speed in Lot, Average Idle Time, and Average Distance Traveled in Lot specified in the Parking Lots window, as well as the *Average Yearly Temperature*, *Elevation*, and *Vehicle Fleet Year* specified in the Setup window. To edit these figures, simply type in the new emission factors and press Apply. To exit the Edit Emissions window without recording changes, press Cancel.

Edit Roadways Emission Factors
To edit the Roadways emission factors, click on the roadway name and press the Edit Emissions button. The Edit Emissions dialog window will appear displaying the emission factors (in grams per vehicle mile) for *CO*, *HC*, *NOx*, *SOx*, and *PM-10*, as calculated by

EDMS based on the Speed as specified in the Roadways window, as well as the *Average Yearly Temperature*, *Elevation*, and *Vehicle Fleet Year* specified in the Setup window. To edit these figures, simply type in the new emission factors and press Apply. To exit the Edit Emissions window without recording changes, press Cancel.

6.2.6 Stationary Sources

The Stationary Sources Window

The Stationary Sources window (Figure 6-9) allows you to specify the stationary source information relevant to your study. *Stationary Source* data are used by EDMS in both emissions and dispersion analyses. For *emissions inventory* purposes, calculations are based upon the Emission Factors for the Category and Type of stationary source (Kg/kiloliter, Kg/*Metric Ton*, or Kg/Thousand cubic liters). For *dispersion analysis*, stationary source emissions are treated as *point sources* by EDMS. Stationary source emissions are located spatially within the airport using the x,y *coordinates*, and take into account Source Height, Source Diameter, Gas Velocity, and Temperature.

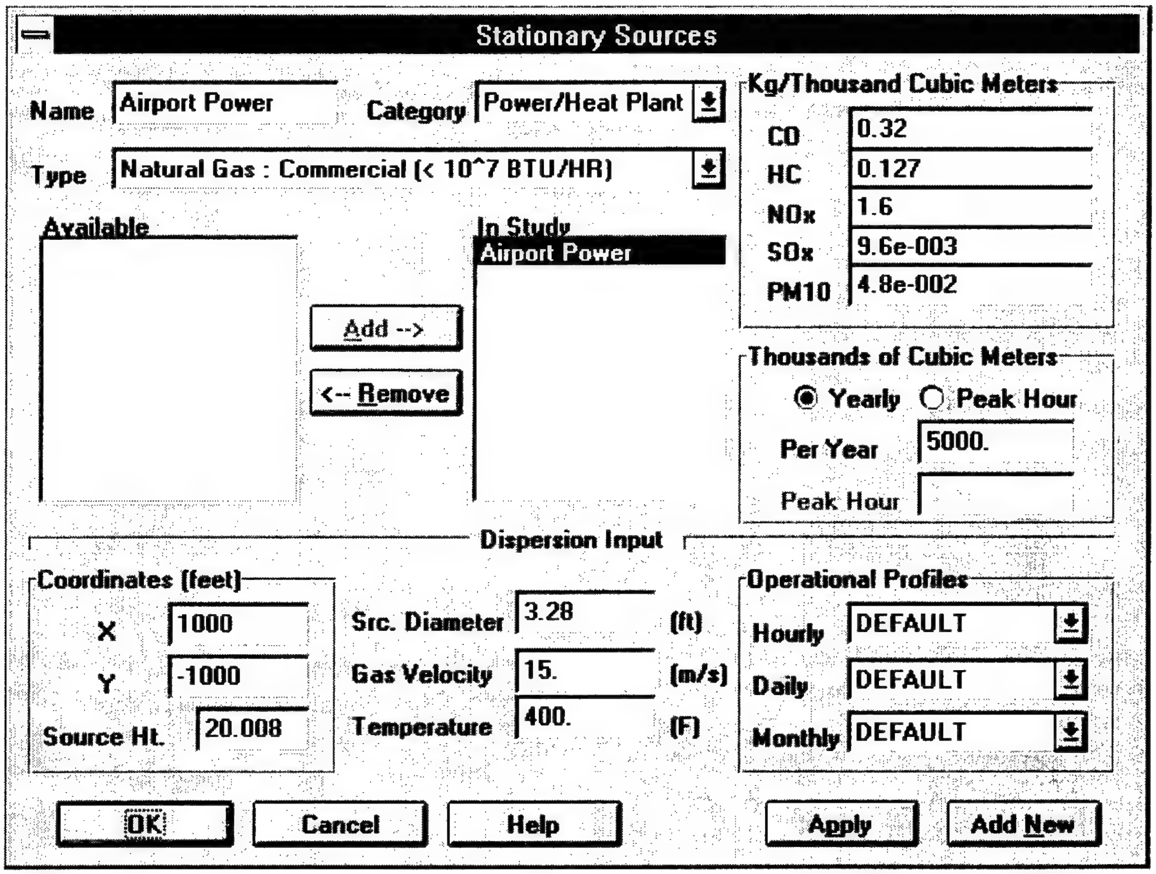


Figure 6-9: The Stationary Sources Window

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding a Stationary source

To add a stationary source, press the Add New button at the bottom of the window and type in the name you wish to give to the stationary source. Next, choose the category of stationary source and, if applicable, the type. Once added, Stationary Sources can remain in the current study, or be moved to a list of available Stationary Sources.

Once you have added a stationary source to your study, additional information will be required depending on whether you are conducting an emissions or dispersion analysis. Emissions information such as emission factors and quantity used are located in the top half of the window. Dispersion information including *coordinates*, source height, category, source diameter, gas velocity, gas temperature (if applicable), and *operational profiles* are located in the lower half of the window.

Editing a Stationary source

To move a stationary source from In Study to Available, select the stationary source name and press Remove. To move a stationary source from the Available list to the In Study list, select the stationary source name and press Add.

Emissions

Stationary Source activity is expressed in per year or peak hour units. The emissions inventory relies on yearly utilization figures. If you know the yearly figure, press the Yearly button and enter the number. If you do not have a yearly figure, you can derive it by providing a peak hour utilization figure and choosing operational profiles that accurately describe the distribution of stationary source activity.

Stationary source emissions are also a function of *emission factors* for the particular source type you are analyzing. If you are using the Category/Other option you will need to provide specific information on Emissions Factors for *CO*, *HC NOx*, *SOx*, and *PM-10*, and quantity used per year. These emissions factors can be found and/or derived using the EPA *Compilation of Air Pollutant Emission Factors (Volume I).*

Dispersion

The dispersion calculations rely on *Peak Hour* operations. If you know the peak hour activity figure, press the Peak Hour button and enter the number. If you do not have a peak hour operations figure, you can derive it by providing a yearly activity figure and choosing operational profiles that accurately describe the distribution of stationary source activity.

In addition, performing a dispersion study requires you to specify Coordinates and Operational Profiles. Default Source Height, Source Diameter, and Gas Velocity information (which is modifiable) will appear for the Category you have specified.

The stationary source coordinates and source height locate the stationary source spatially in your airport configuration. Type in the (x,y) *coordinates* and source height for the stationary source in their respective text fields.

Operational Profiles

Modifications to Operational Profiles default settings may be made at the *Hourly*, *Daily*, or *Monthly* levels. However, the modifications are made and named using the *Operational Profiles* window under the File pulldown menu. Once modifications have been made, the new name will appear under the appropriate drop down menu and may be selected. Please note that modifications to any one of the hourly, daily, or monthly default settings will affect the operational figures.

Graphical Display

Stationary Sources that are part of the In Study list are displayed in the *Airport Graphical Display* (View/Airport). Stationary Sources in the Available list are not displayed.

6.2.7 Training Fires

The Training Fires Window

The Training Fires window (Figure 6-10) allows you to specify the training fire information relevant to your study. Training Fires data are used by EDMS in calculating the *emissions inventory* and in performing the *dispersion analysis*. For emissions purposes, calculations are based upon the Fuel Type and Gallons of Fuel Used for those fires. For dispersion analyses,

Training Fire emissions are treated as *point sources* by EDMS. Training fire emissions are located spatially within the airport using the x,y *coordinates*, and take into account the Source Height, Temperature, Source Diameter, and Gas Velocity of each fire.

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

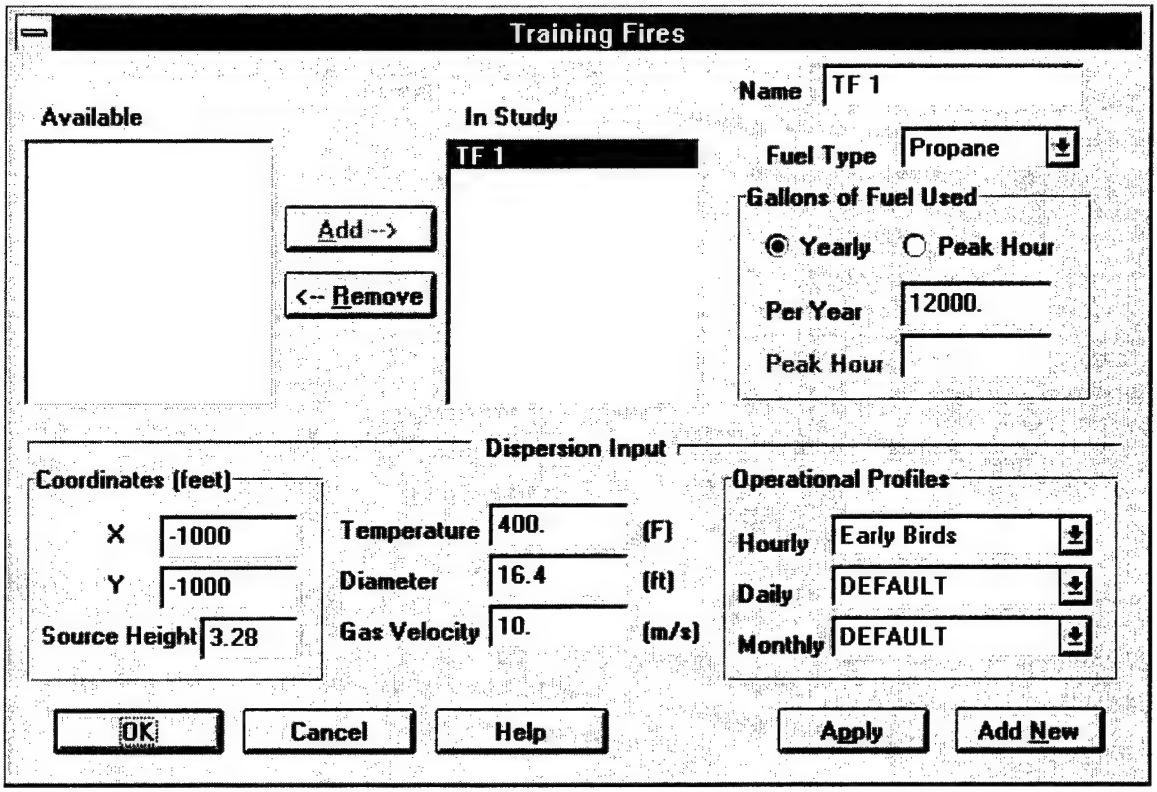


Figure 6-10: The Training Fires Window

Adding a Training Fire

To add a training fire, press the Add New, button at the bottom of the window and type in the training fire name. Once added, training fires can remain in the current study, or be moved to a list of available training fires.

Once you have added a training fire to your study, additional information will be required depending on whether you are conducting an emissions inventory or performing dispersion analysis. Emissions information such as fuel type and gallons of fuel used are located in the top half of the window. Dispersion information including coordinates, training fire elevation, combustion temperature, diameter, gas velocity, and operational profiles are located in the lower half of the window.

Editing a Training Fire

To move a training fire from In Study to Available, select the training fire name and press Remove. To move a training fire from the Available list to the In Study list, select the training fire name and press Add.

Emissions

An emissions study that includes training fires will require you to provide specific information on Fuel Type, and Gallons of Fuel Used.

Training Fire activity is expressed either in gallons of fuel used per year or gallons of fuel used at peak hour. The emissions inventory relies on yearly operations. If you know the

yearly operations figure, press the Yearly button and enter the number. If you do not have a yearly operations figure, you can derive it by providing a peak hour operations figure and choosing operational profiles that accurately describe the distribution of training fire activity.

Training fire emissions are also a function of fuel type. Specify the fuel type for the training fire by selecting from the drop down menu.

Dispersion

The dispersion calculations rely on *Peak Hour* operations. If you know the peak hour activity figure, press the Peak Hour button and enter the number. If you do not have a peak hour operations figure, you can derive it by providing a yearly activity figure and choosing operational profiles that accurately describe the distribution of training fire activity.

In addition, performing a dispersion analysis requires you to specify *Coordinates*, Source Height, Temperature, Diameter, and Gas Velocity figures.

The training fire *coordinates* and source height locate the training fire spatially in your airport configuration. Type in the (x,y) coordinates and elevation for the training fire in their respective text fields.

Training fire dimensions and burn characteristics are also required for dispersion analysis. Enter the burn temperature, diameter, and gas velocity relevant to the type of training fire being analyzed.

Operational Profiles

Modifications to Operational Profiles default settings may be made at the *Hourly*, *Daily*, or *Monthly* levels. However, the modifications are made and named using the *Operational Profiles* window under the File pulldown menu. Once modifications have been made, the new name will appear under the appropriate drop down menu and may be selected. Please note that modifications to any one of the hourly, daily, or monthly default settings will affect the operational figures.

Graphical Display

Training Fires that are part of the In Study list are displayed in the *Airport Graphical Display* (View/Airport). Training Fires in the Available list are not displayed.

6.2.8 Run Emissions Inventory

Run Emissions Inventory

When all emissions data has been entered, the *emissions inventory* can be run by selecting Emissions/Run Emissions Inventory from the pulldown menu. When the emissions inventory is completed, the Emissions Inventory: Summary window will appear displaying the emissions totals for the emissions categories in the study.

6.3 The Airport Menu

- Runways
- Aircraft Taxiways
- Gates
- Configurations
- Aircraft Assignments

6.3.1 Runways and Runway Queues

The Runways and Runway Queues Window

The Runways and Runway Queues window (Figure 6-11) allows you to specify the names and locations of *runways* for your airport and associated queues with those runways. Emissions data associated with runways are utilized by EDMS for dispersion analyses. To calculate dispersion, aircraft assignments are made to specific runways having a spatial location within the airport (x,y *coordinates*). EDMS treats runways as *line sources* for purposes of *dispersion analysis.*

As in all EDMS dialog windows containing an Apply button, pressing Apply allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

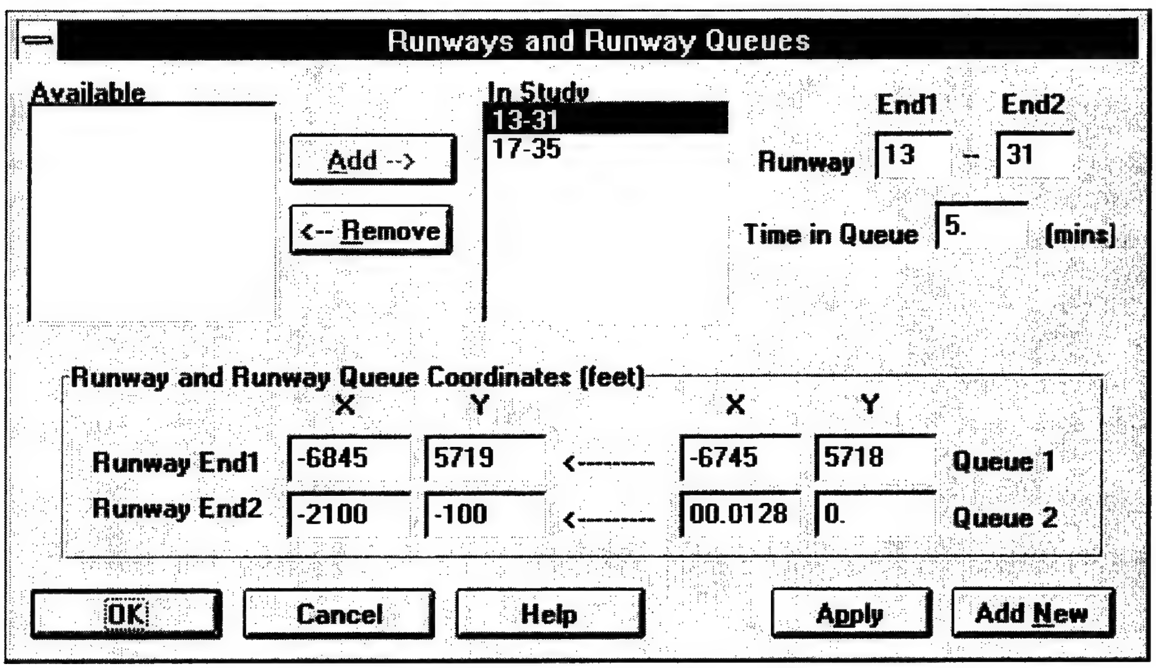


Figure 6-11: The Runways and Runway Queues Window

Adding Runways and Runway Queues

To add a runway, press Add New, then enter the names and coordinates of the runway end points (End 1 and End 2) and the associated queue coordinates in the appropriate fields. Naming the runway endpoints gives the user the option of following the runway naming convention currently employed world wide (e.g., 9-27), or of using a customized runway name (no more than 3 characters for each endpoint). The direction of travel on a given runway for a given aircraft is specified in the *Aircraft Assignments* window (and in the *Configurations* window if configurations have been specified and assigned) by selecting a specific runway end. Once added, runways can remain in the current study or be moved to a list of available runways. Next, enter the queue duration by entering the *Time in Queue*.

Note: A queue with a length of less than 20 meters or a Time in Queue of zero will not be included in the dispersion analysis.

Editing Runways and Runway Queues

To move a runway from In Study to Available, select the runway name and press Remove. Note: Removing a runway from the study will result in all dispersions from that runway being removed. If a runway has been specified in a Configuration, the runway cannot be removed from the study without first changing the configuration's runway selection, or deleting the configuration from the study. To move a runway from the Available list to the In Study list, select the runway name and press Add. To adjust the Time in Queue, runway coordinates, and queue coordinates for a runway, select the runway, type in the new information, and press Apply.

Graphical Display

Runways and runway queues that are part of the In Study list are displayed in the *Airport Graphical Display*. Runways and runway queues in the Available list are not displayed.

6.3.2 Aircraft Taxiways

The Aircraft Taxiways Window

The Aircraft Taxiways window (Figure 6-12) allows you to specify the names and location of *taxiways* for your airport. Emissions data associated with aircraft taxiways are utilized by EDMS for calculation of both the *emissions inventory* and *dispersion analysis*. To calculate dispersion, *aircraft assignments* are made to specific taxiways having an operational duration (taxi time), and a spatial location within the airport (x,y *coordinates*). EDMS treats taxiways as *line sources* for purposes of dispersion analysis.

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding Aircraft Taxiways

To add a taxiway, press Add New, then enter the taxiway name and coordinates in the appropriate fields. Once added, taxiways can remain in the current study, or be moved to a list of available taxiways.

Taxi Time specifies the duration of the taxi and will apply to all aircraft assigned to that taxiway. Set the Taxi Time by typing in the time in minutes and pressing Apply.

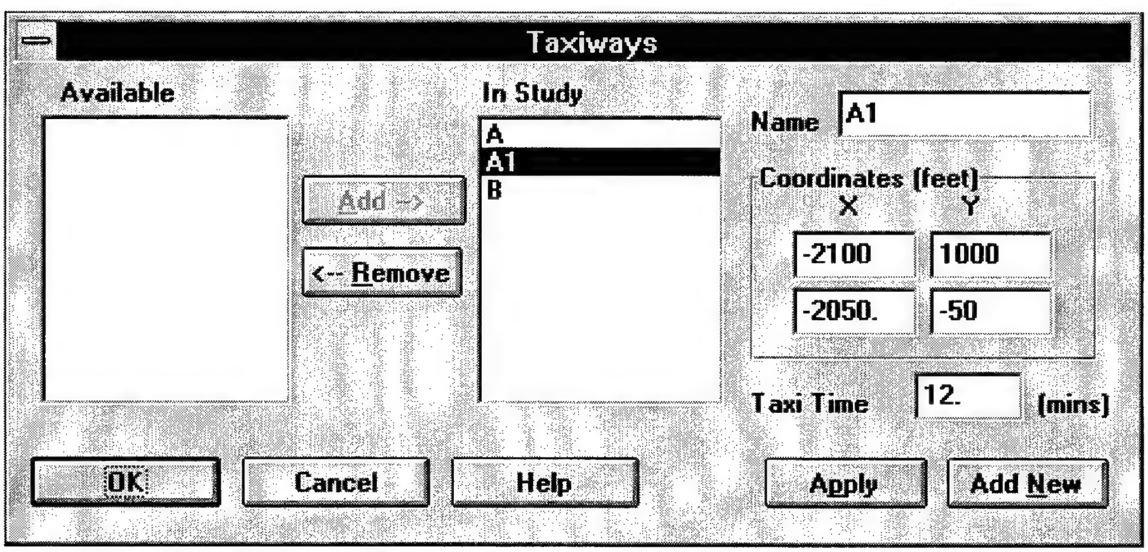


Figure 6-12: The Aircraft Taxiways Window

Editing Aircraft Taxiways
To move a taxiway from In Study to Available, select the taxiway name and press Remove. To move a taxiway from the Available list to the In Study list, select the taxiway name and press Add. *Note: If a taxiway has been specified in a Configuration, the taxiway cannot be removed from the study without first changing the configuration's taxiway selection, or deleting the configuration from the study.*

Coordinates and Taxi Time can both be modified by adding the taxiway to the In Study list, selecting the taxiway name, and typing in the new figures.

Graphical Display
Taxiways that are part of the In Study list are displayed in the *Airport Graphical Display*. Taxiways in the Available list are not displayed.

6.3.3 Gates

The Airport Gates Window
The Airport Gates window (Figure 6-13) allows you to specify the ID and location of each *gate* in your airport. In the context of EDMS dispersion analyses, GSE, AGE, and APU emissions are considered to originate from the airport gate locations specified in this module.

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

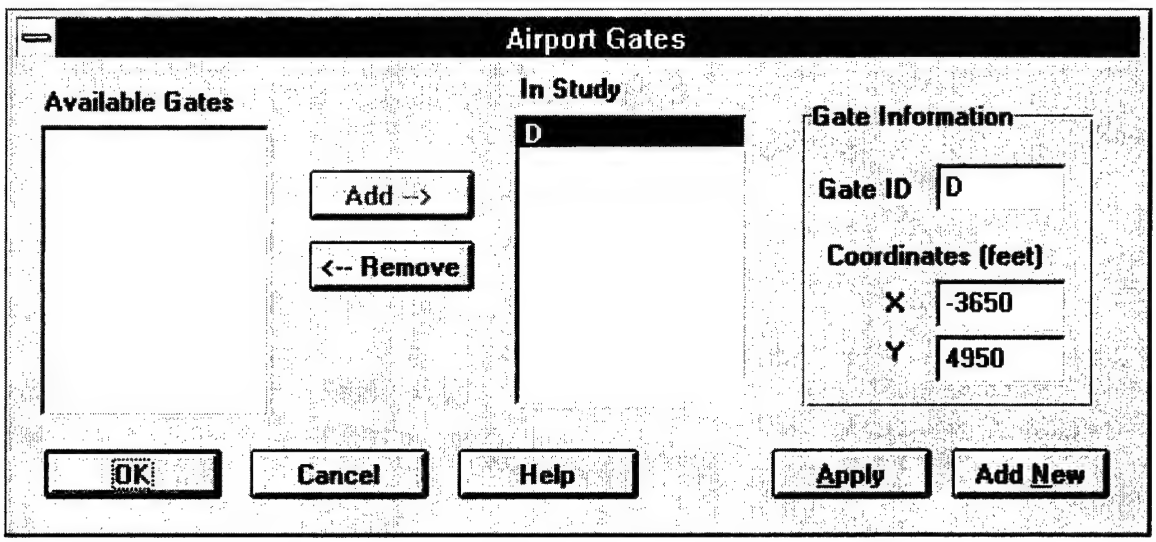


Figure 6-13: The Airport Gates Window

Adding Airport Gates
To add a gate, press Add New, and type in the gate ID and *coordinates* in the appropriate fields. Once added, gates can remain in the current study, or be moved to a list of available gates.

Editing Airport Gates
To move a gate from In Study to Available, select the gate name and press Remove. To move a gate from the Available list to the In Study list, select the gate name and press Add.

Graphical Display
Gates that are part of the In Study list are displayed in the *Airport Graphical Display*. Gates in the Available list are not displayed.

6.3.4 Configurations

The Runway/Taxiway Configurations Window

The Runway/Taxiway Configurations dialog window, (Figure 6-14), allows you to specify certain weather-based conditions under which particular *runway* and *taxiway* assignments will be made for *active aircraft* employing the Use Configurations option (see *Aircraft Assignments*). These conditions consist of a wind angle range and a maximum wind speed. Specifying configurations allows you to assign aircraft to runways and taxiways using criteria similar to those employed in an actual airport operating environment (i.e., wind speed and direction).

When the Use Configurations option is selected in the Aircraft Assignments window, EDMS makes use of the conditions specified under each Configuration ID by checking the specified configuration parameters (Wind Angle and Wind Speed) against those supplied in the *imported* or *user-specified weather files* for each hour of the dispersion analysis. If, in a given hour, the weather files include a wind angle within the specified range and a wind speed not exceeding the specified maximum, EDMS will use the runway and taxiway assignments specified in that configuration. If either of the configuration criteria are not met, the default runway and taxiway assignments specified in the Aircraft Assignments window will be used instead.

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding a Configuration

To add a configuration, press the Add New button and type in a Configuration ID. Specify a Wind Angle Range by entering the lower number of the range in the first text box and the higher number in the second text box. Next, specify the Maximum Speed (wind speed in knots) for the configuration.

Once added, a Configuration ID will be listed among the Available Configurations in the study and can be utilized in the calculation of dispersion for any active aircraft employing the Use Configurations option under the Aircraft Assignments window.

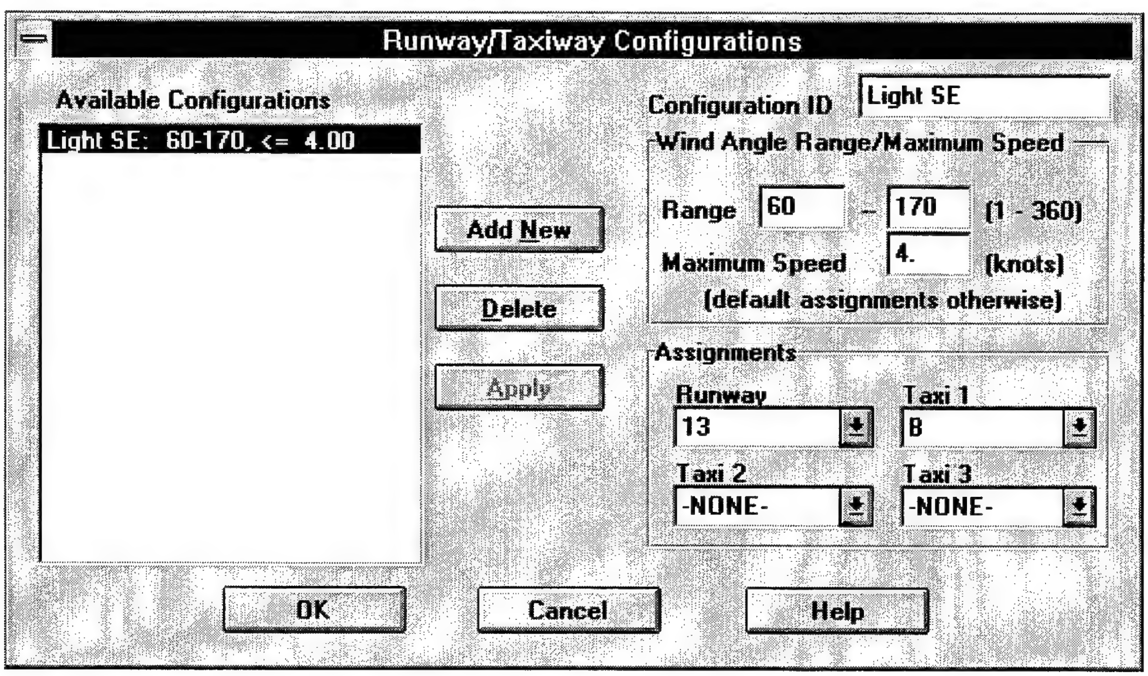


Figure 6-14: The Runway/Taxiway Configurations Window

Editing a Configuration
Most fields may be edited by simply selecting the field and typing in the new information, and pressing OK. To delete a configuration from the study, select the Configuration ID you wish to delete from the list of Available Configurations and press the Delete button.

6.3.5 Aircraft Assignments

The Aircraft Assignments Window
The Aircraft Assignments window (Figure 6-15) allows you to specify default *runway, taxiway*, and *gate* assignments for each *Active Aircraft* in the study. The available runways, taxiways, and gates are created under the respective Airport pulldown menu options. Assignment of aircraft types to runways and taxiways can be made by specifying the default assignment in this window. In addition, dynamic aircraft assignments can be made by using the runway and taxiway assignments specified under the *Configurations* dialog window. The assignment of aircraft types to runways, taxiways, and gates becomes the basis for the EDMS dispersion analysis by locating the *aircraft types* and associated equipment spatially within the airport.

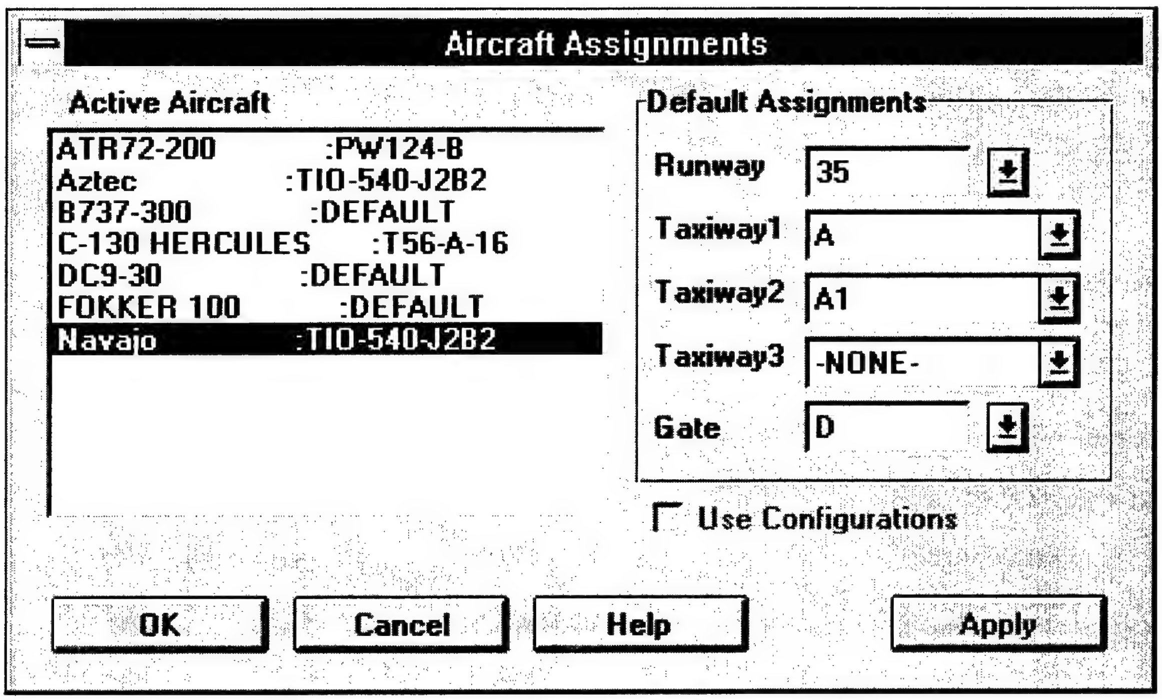


Figure 6-15: The Aircraft Assignments Window

For aircraft assigned to a particular runway, the dispersion calculations will treat all takeoff emissions for that aircraft as emanating from that runway. However, if the Use Configurations check box is checked, EDMS will (for each hour of the dispersion run) check to see if a valid configuration exists. If a valid configuration exists in a given hour, dispersion will be calculated for that hour based on the runway assignment made in the Configurations dialog window. Taxiway emissions consist of taxi-generated emissions for the duration specified in the taxiway dialog window. As with runway assignments, dispersion calculations will utilize the taxiway assignments specified in this window unless the Use Configurations check box is checked and the configuration parameters are met. For aircraft assigned to a particular gate, the dispersion calculations will treat all GSE, AGE, and APU emissions for that aircraft as emanating from that gate.

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding an Aircraft Assignment

Selecting an aircraft type in the Active Aircraft field will display a list of available runway endpoints, taxiways, and gates. Select the runway endpoint, taxiway(s), and gate assignment for each active aircraft and press Apply. *Note that the direction of takeoff is established by assigning an aircraft to the runway endpoint from which it will be traveling.*

Editing an Aircraft Assignment

Aircraft can be deassigned to taxiways by selecting the active aircraft and choosing "-NONE-" from the drop down list of taxiways. While an active aircraft must be assigned to a runway and gate, you can change assignments by selecting the active aircraft, selecting a new runway and gate from the drop down menu, and pressing Apply.

6.4 The Dispersion Menu

- Discrete Receptors
- Grid Receptors
- Meteorology
- Run

6.4.1 Discrete Receptors

The Discrete Receptors Window

The Discrete Receptors window (Figure 6-16) allows you to specify the location and height of *receptors* at your airport. In a dispersion analysis, the receptor locations specified in this module constitute theoretical measuring points for the dispersion of pollutants generated by the emissions sources specified in your study. The calculation of dispersion is based on a combination of receptor placement, *pollutants generated*, and factors such as source locations, temperature, wind speed, wind direction, and the *Pasquill-Gifford Stability Classification. Note: There is a significant increase in dispersion run time as the number of receptors increases.*

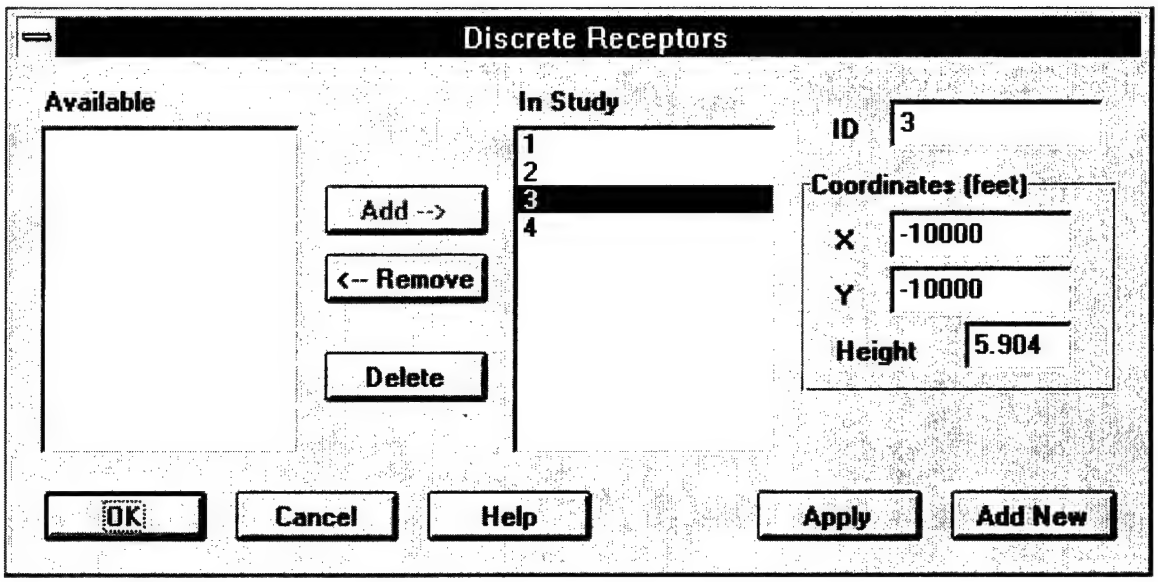


Figure 6-16: The Discrete Receptors Window

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding Discrete Receptors

To add a receptor, press Add New, then enter the receptor ID, x,y *coordinates*, and receptor height in the appropriate fields. Once added, receptors can remain in the current study, or be moved to a list of available receptors.

Editing Discrete Receptors

To move a receptor from In Study to Available, select the receptor ID and press Remove. To move a receptor from the Available list to the In Study list, select the receptor ID and press Add.

To delete a receptor, remove the receptor ID from the study and then press Delete.

Note: Receptors added under the Grid receptors module are displayed in this window as well, and can be edited in the same manner as discrete receptors.

Graphical Display
Receptors that are part of the In Study list are displayed in the *Airport Graphical Display.* Receptors in the Available list are not displayed.

6.4.2 Grid Receptors

The Grid Receptors Window
The Grid Receptors window (Figure 6-17) allows you to specify the Grid Name and define the location, area, and density of a grid of *receptors* at your airport in blocks rather than singly (as in the *Discrete Receptors* module). In a dispersion analysis, the receptor locations specified in this module constitute theoretical measuring points for the dispersion of pollutants generated by the sources specified in your study. The calculation of dispersion is based on a combination of receptor placement, *pollutants generated,* and factors such as source locations, temperature, wind speed, wind direction, and the *Pasquill-Gifford Stability Classification. Note: There is a significant increase in dispersion run time as the number of receptors increases.*

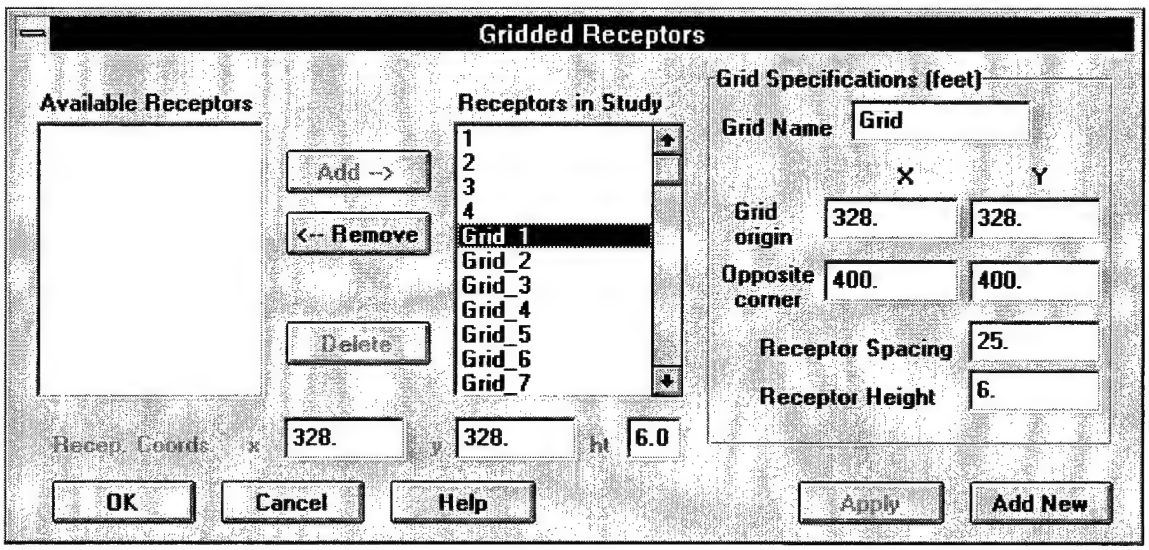


Figure 6-17: The Gridded Receptors Window

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Adding Grid Receptors
To add a grid of receptors, press Add New, then enter the Grid Name, x,y *coordinates* defining the corners of the grid, Receptor Spacing, and Receptor Height in the appropriate fields. Once added, individual receptors in the grid can remain in the current study, or be moved to a list of available receptors. In addition, a range of adjacent receptors can be selected from a list by selecting one end of the range, holding down the *shift* key, and selecting the other end of the range. A group of individual (non-adjacent) receptors can be selected by holding down the *control* key and selecting the receptors from a list. These selected receptors can then be added, moved, or deleted as a group.

The Receptor Coordinates field at the bottom of the window allows you to view the coordinates for a given receptor in the study by simply selecting the receptor you wish to view from the Receptors In Study list.

Editing Grid Receptors

To move a grid receptor from In Study to Available, select the receptor name and press Remove. To move a grid receptor from the Available list to the In Study list, select the receptor name and press Add.

To delete a grid receptor, remove the grid receptor from the study and then press Delete.

In addition, a range of adjacent receptors can be selected from a list by selecting one end of the range, holding down the *shift* key, and selecting the other end of the range. A group of individual (non-adjacent) receptors can be selected by holding down the *control* key and selecting the receptors from a list. These selected receptors can then be added, moved, or deleted as a group.

Graphical Display

Grid receptors that are part of the In Study list are displayed in the *Airport Graphical Display*. Grid receptors in the Available list are not displayed.

6.4.3 Meteorology

The Meteorological Data Window

The Meteorological Data window (Figure 6-18) allows you to specify weather data including Temperature, Wind Speed, Wind Direction, and *Pasquill-Gifford Stability Classification* for any given hour of the year. In addition, weather data can be specified for blocks of time including parts or all of days, or months. You can also import weather files by pressing the Import NCDC button. In the absence of imported weather data files, the Meteorological Data window allows you to create weather information necessary for dispersion analysis. The following rules govern the population of fields in this window: 1). The year is 365 days (February 29th cannot be modeled); 2). A specified time frame cannot cross into a new year; and 3). January 1st is always a Monday.

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

Importing NCDC Weather Files

EDMS allows you to import weather data files from the National Climatic Data Center (NCDC). However, EDMS requires that weather data be obtained directly from NCDC in the WBAN Hourly Surface Observations TD-1440 format. Since EDMS requires a full year's data (12 consecutive months in a calendar year), make sure you order and load a full calendar year of weather files (1 file = 3 months) from NCDC.

NCDC weather data files can be obtained by writing or calling:

National Climatic Data Center
151 Patton Avenue, Room 120
Asheville, NC 28801-5001
(704) 271-480

To load your TD-1440 files, press the Import NCDC button. When the Verify Latitude/Longitude window appears, you will have an opportunity to confirm the airport *latitude* and *longitude* coordinates for your airport. These coordinates are used in the calculation of the *Pasquill Gifford Stability Classification*. After you have verified the airport coordinates, press OK. To exit this window without loading weather files, press Cancel.

After you verify the airport coordinates and press OK, the NCDC Files Location window will appear. Select the directory where you have stored your weather files, then enter the 5 digit station number (which corresponds to the weather file name) and press OK.

When the weather file has been completely loaded, it will appear in the File drop down menu (and also in the Weather File drop down menu of the *Run Dispersion* dialog window).

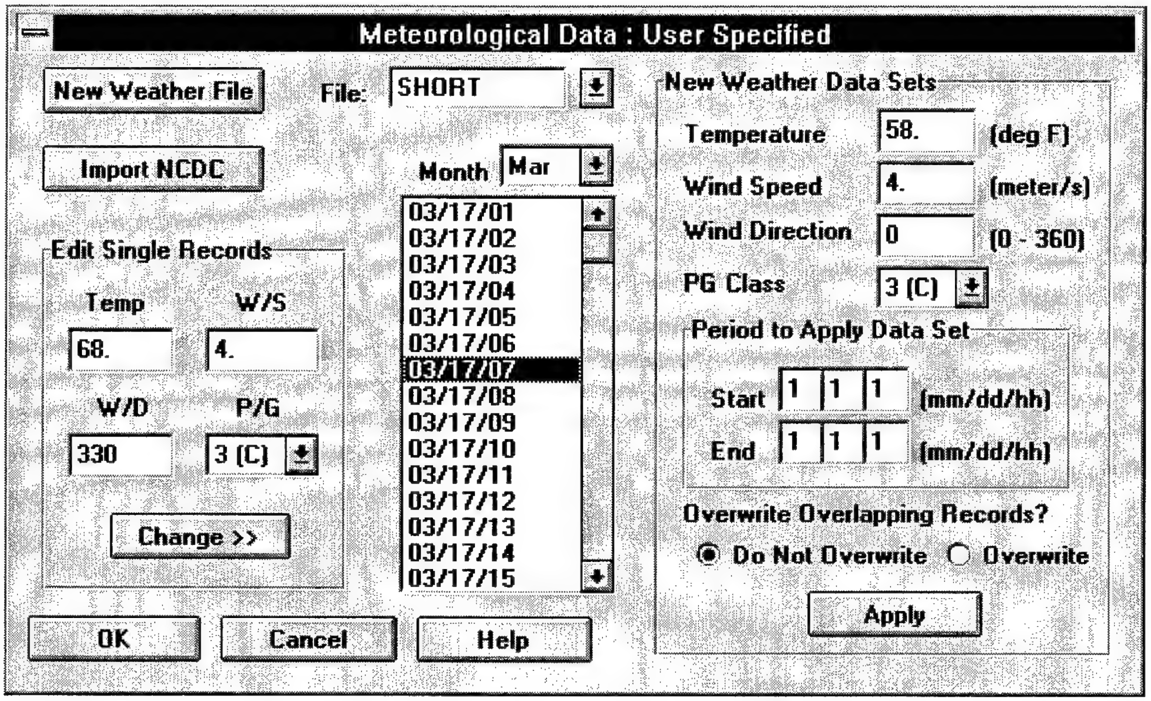


Figure 6-18: The Meteorological Data Window

Adding Meteorological Data Records

To add a new Weather File, press New Weather File and type in a name for the new file. Next, enter the temperature, wind speed, wind direction, and P/G Class in the New Weather Data Sets fields. The weather data you specify will be applied to the entire time frame you specify under the Period to Apply Data Set. However, you can also edit individual records (mm/dd/hh) one at a time using the Edit Single Records fields (see below).

Once the weather data sets have been specified, select a time frame using the Period to Apply Data Set. Using the months, days, and hours (mm/dd/hh) fields, specify a start and end month, day, and hour. Hour designations use the following convention: Midnight to 1 a.m. is hour 1; 11 p.m. to Midnight is hour 24. For example, to provide weather data for only the hour of 4 p.m. to 5 p.m. on January 8, the start time would be 1/8/17 and the end time would also be 1/8/17. Weather data for the period beginning at 11 a.m. January 8 and ending at 9:59 p.m. February 14 would be expressed as a start time of 1/8/12 and an end time of 2/14/22.

Editing Meteorological Data Records

Once created, a weather file can be modified, but cannot be deleted. The weather file can be overwritten by specifying the identical time frame as the existing file, typing in the new weather data, choosing the Overwrite radio button, and pressing Apply. You can also add to the time period currently specified by extending the time frame. If you want the new data to apply to both the new and old time frame, choose the Overwrite radio button and press Apply. If you want the extended period to have a different weather data configuration from the existing weather file and you want to preserve the existing weather file, enter the new data for the extended period, choose the Do Not Overwrite radio button, and press Apply.

To edit individual records in a existing weather file, select the record you want to modify, type the new information in the Edit Single Records fields, and press the Change button.

6.4.4 Run Dispersion

Run Dispersion

When all dispersion data have been entered, the *dispersion analysis* can be run by selecting Dispersion/Run from the pulldown menu. When the Run Dispersion dialog window appears (Figure 6-19), select a weather file from the drop down menu. The Run Duration is set to run the dispersion for all records in file (checkbox checked). To specify custom start and end times for the run duration, uncheck the checkbox, enter the start and end times and press Run. To exit this window without executing the dispersion run, press Cancel.

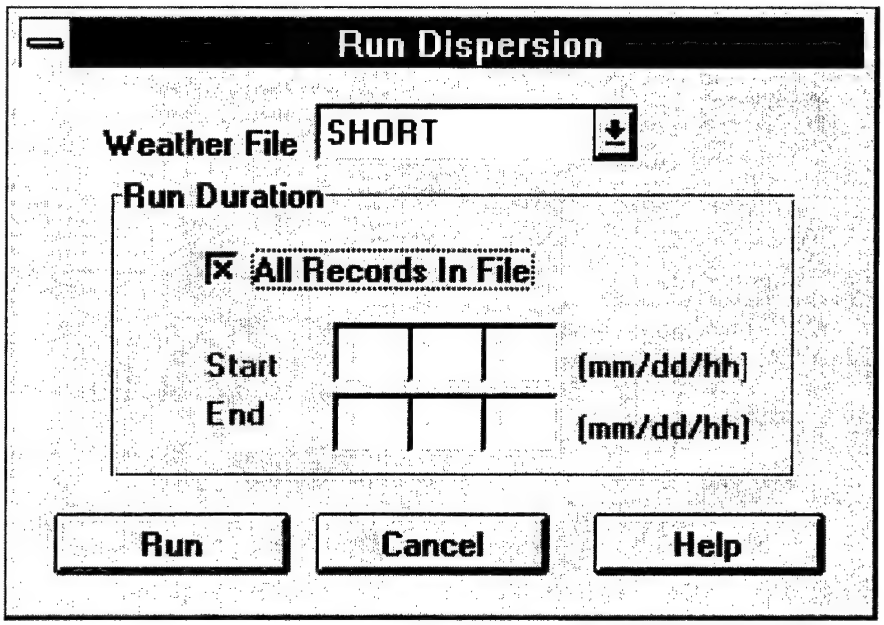


Figure 6-19: The Run Dispersion Dialog Window

6.5 The View Menu

- Airport
- Emissions Inventory
- Concentrations
- System Tables
- Standards (NAAQS)

6.5.1 Airport

View Airport Graphical Display

The airport layout (Figure 6-20) can be viewed graphically at any time by selecting View/Airport from the pulldown menu. The *airport name*, and legend are displayed at the top of the screen. The airport layout is displayed against x,y coordinates such that the y axis runs North/South and the x axis runs East/West. You can locate the *coordinates* of your position anywhere on the view screen by placing the cursor and noting the coordinates displayed in the status bar at the bottom of the screen. EDMS automatically selects the best scale (also displayed on the lower screen border) to fit your airport layout on the view screen. You can also use the zoom-in and zoom-out buttons or the zoom pulldown options under View to obtain the perspective you desire. The home button returns you to the original scale computed by EDMS. To close this window double click on the [-] or press ctrl+F4.

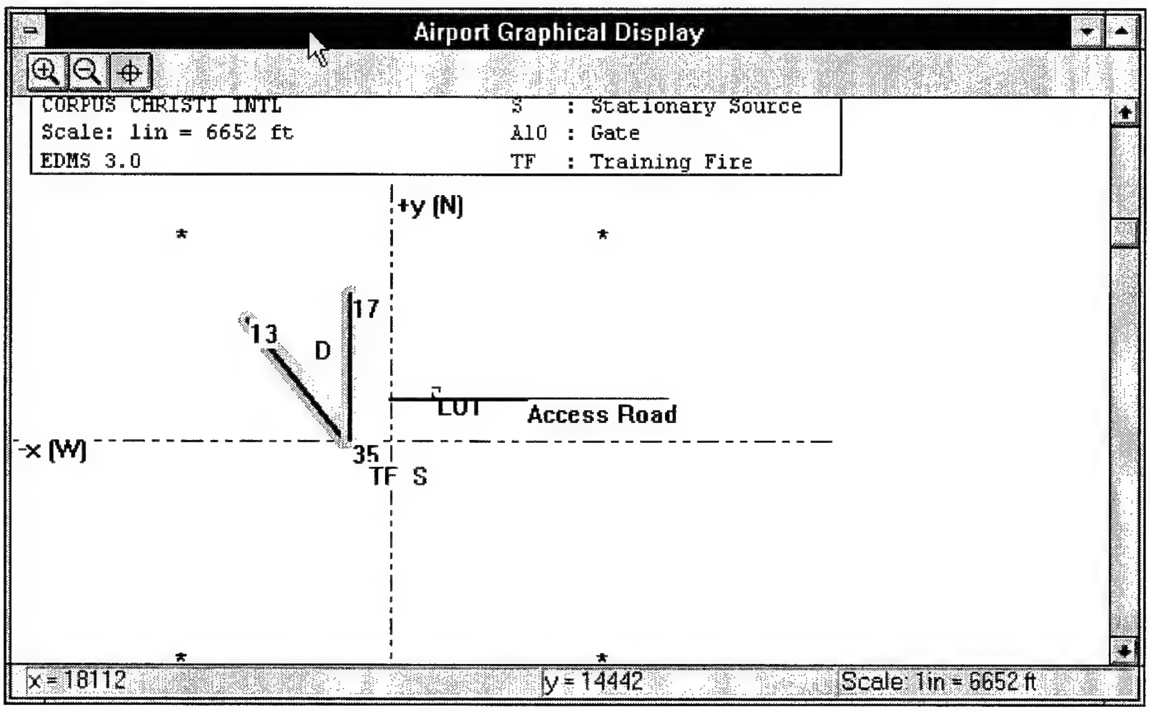


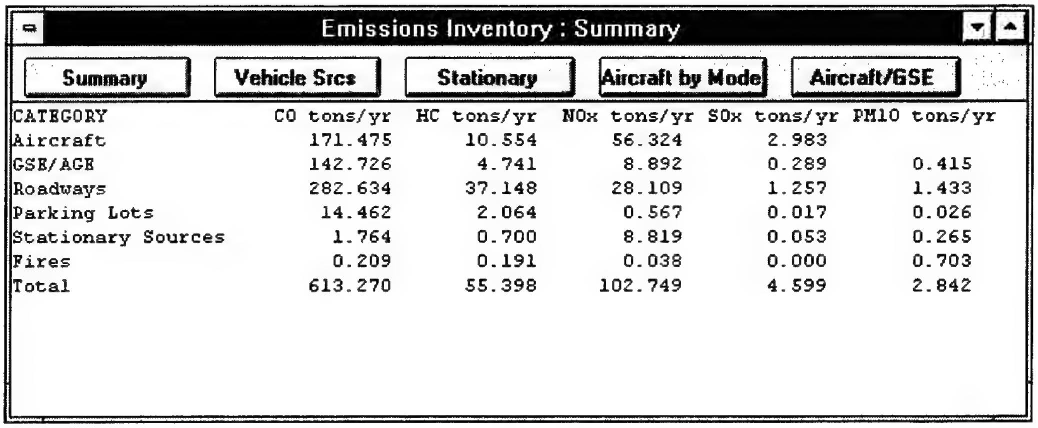
Figure 6-20: The Airport Graphical Display Window

6.5.2 Emissions Inventory

View Emissions Inventory

The emissions inventory results can be viewed by selecting View/Emissions Inventory from the pulldown menu. When the emissions inventory window (Figure 6-21) appears, summary information on all categories of emissions sources currently in the study will be displayed. In addition, you can choose to view emissions by Vehicle Sources, Stationary Sources, Aircraft by Mode, and Aircraft/GSE by pushing the button corresponding to these categories at the

top of the screen. For example, while the summary screen displays total emissions for all roadways in the study, clicking on the Vehicle Sources button will display emissions for each roadway in the study. To return to the Summary information screen, press the Summary button. To close this window, double click on the [-] or press ctrl+F4.



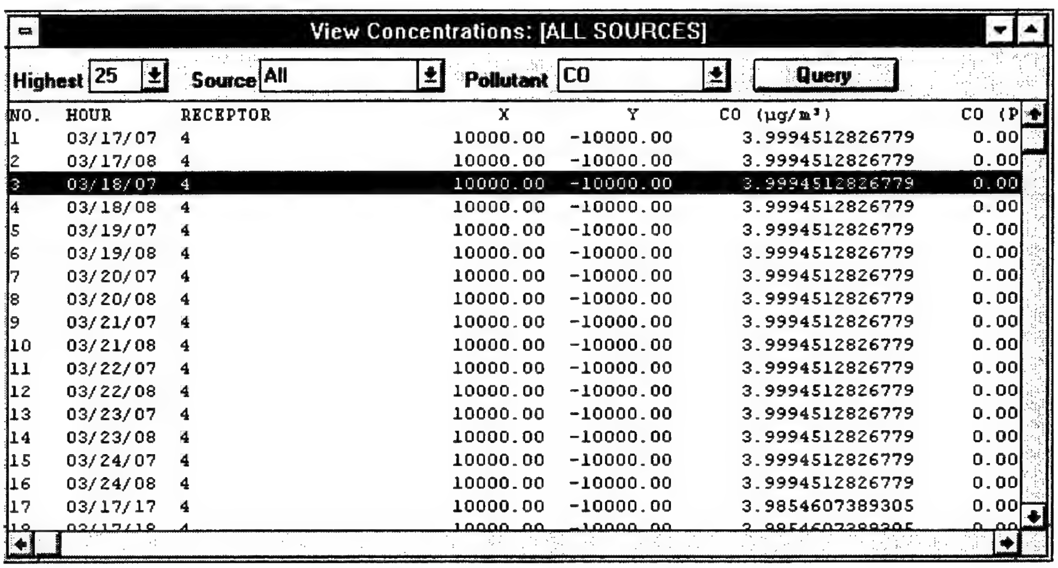
CATEGORY	CO tons/yr	HC tons/yr	NOx tons/yr	SOx tons/yr	PM10 tons/yr
Aircraft	171.475	10.554	56.324	2.983	
GSE/AGE	142.726	4.741	8.892	0.289	0.415
Roadways	282.634	37.148	28.109	1.257	1.433
Parking Lots	14.462	2.064	0.567	0.017	0.026
Stationary Sources	1.764	0.700	8.819	0.053	0.265
Fires	0.209	0.191	0.038	0.000	0.703
Total	613.270	55.398	102.749	4.599	2.842

Figure 6-21: The View Emissions Inventory Window

6.5.3 Concentrations

The View Concentrations Window

The View Concentrations window (Figure 6-22) allows you query the dispersion run results to examine the highest concentrations of generated pollutants. You can view up to 200 of the highest concentrations, and specify the Source and Type of pollutant.



NO.	HOUR	RECEPTOR	X	Y	CO (µg/m³)	CO (P
1	03/17/07	4	10000.00	-10000.00	3.9994512826779	0.00
2	03/17/08	4	10000.00	-10000.00	3.9994512826779	0.00
3	03/18/07	4	10000.00	-10000.00	3.9994512826779	0.00
4	03/18/08	4	10000.00	-10000.00	3.9994512826779	0.00
5	03/19/07	4	10000.00	-10000.00	3.9994512826779	0.00
6	03/19/08	4	10000.00	-10000.00	3.9994512826779	0.00
7	03/20/07	4	10000.00	-10000.00	3.9994512826779	0.00
8	03/20/08	4	10000.00	-10000.00	3.9994512826779	0.00
9	03/21/07	4	10000.00	-10000.00	3.9994512826779	0.00
10	03/21/08	4	10000.00	-10000.00	3.9994512826779	0.00
11	03/22/07	4	10000.00	-10000.00	3.9994512826779	0.00
12	03/22/08	4	10000.00	-10000.00	3.9994512826779	0.00
13	03/23/07	4	10000.00	-10000.00	3.9994512826779	0.00
14	03/23/08	4	10000.00	-10000.00	3.9994512826779	0.00
15	03/24/07	4	10000.00	-10000.00	3.9994512826779	0.00
16	03/24/08	4	10000.00	-10000.00	3.9994512826779	0.00
17	03/17/17	4	10000.00	-10000.00	3.9854607389305	0.00

Figure 6-22: The View Concentrations Window

Setting Up a Query

To query the results of an EDMS dispersion run, specify the range of the highest concentrations (10-200) you wish to view using the Highest drop down menu. Next, select the source type from the Source drop down menu. Finally select the type of *pollutant* you wish to examine using the Pollutant drop down menu. In addition, under the Pollutants menu you can view average concentrations for certain pollutants (*CO*, *SOx*, and *PM-10*) for certain specified time periods (8 or 24 hour periods, as well as the Annual Arithmetic Mean (*AAM*) for average yearly concentrations). The 8 and 24 hour figures are calculated as sliding

averages. For example, a query of 8 hour CO concentrations will yield averages for hours 1-8 of your dispersion run period, followed by hours 2-9, 3-10, and so on for each 8 hour group.

Running a Query

Once you have completed the set up, you can execute the query by pressing the Query button. Results of your query will be displayed and can be printed using the File/Print pulldown menu option.

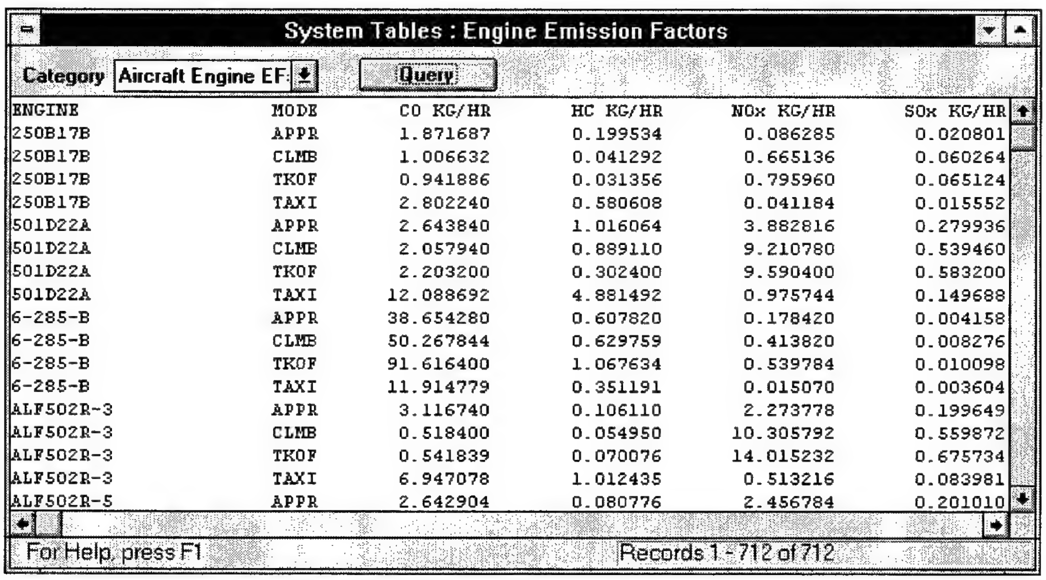
6.5.4 System Tables

The View System Tables Window

The View System Tables window (Figure 6-23) allows you to retrieve *emission factor* data for emission sources in the following categories:

- Aircraft Engine
- APU
- GSE/AGE
- MOBILE5a
- Stationary Sources
- Training Fires

Within each category is a listing of equipment/source types with corresponding emission factor data for each of the relevant *criteria pollutants*.



ENGINE	MODE	CO KG/HR	HC KG/HR	NOx KG/HR	SOx KG/HR
250B17B	APPR	1.871687	0.199534	0.086285	0.020801
250B17B	CLMB	1.006632	0.041292	0.665136	0.060264
250B17B	TKOF	0.941886	0.031356	0.795960	0.065124
250B17B	TAXI	2.802240	0.580608	0.041184	0.015552
501D22A	APPR	2.643840	1.016064	3.882816	0.279936
501D22A	CLMB	2.057940	0.889110	9.210780	0.539460
501D22A	TKOF	2.203200	0.302400	9.590400	0.583200
501D22A	TAXI	12.088692	4.881492	0.975744	0.149688
6-285-B	APPR	38.654280	0.607820	0.178420	0.004158
6-285-B	CLMB	50.267844	0.629759	0.413820	0.008276
6-285-B	TKOF	91.616400	1.067634	0.539784	0.010098
6-285-B	TAXI	11.914779	0.351191	0.015070	0.003604
ALF502R-3	APPR	3.116740	0.106110	2.273778	0.199649
ALF502R-3	CLMB	0.518400	0.054950	10.305792	0.559872
ALF502R-3	TKOF	0.541839	0.070076	14.015232	0.675734
ALF502R-3	TAXI	6.947078	1.012435	0.513216	0.083981
ALF502R-5	APPR	2.642904	0.080776	2.456784	0.201010

Figure 6-23: The View System Tables Window

Viewing System Tables

To view emission factor data for a category, select the category you wish to view using the drop down menu. Once you have selected (highlighted) the category, press the Query button. A list of equipment/source types will appear along with emission factor data for some criteria pollutants. Use the scroll bars if necessary to view the entire list of equipment/source types and emission factors.

Printing System Tables

You can print the emission factor data for the category you are viewing by selecting File/Print from the pull down menu.

6.5.5 Standards (NAAQS)

The National Ambient Air Quality Standards (NAAQS) are composed of primary and secondary standards, and short term and long term standards. The EPA Office of Air Quality Planning and Standards (OAQPS) may be contacted to obtain further information on any of the standards. With the exception of the standards for Ozone and Lead and the 3-hour Sulfur Dioxide secondary standard, EDMS will generate concentrations that can be compared against the NAAQS.

Primary Standards are the most rigorous, defining the air quality standard required to prevent any adverse impact on human health.

Secondary Standards define the air quality standards required to prevent adverse effects on vegetation, property, or other elements of the environment.

Short and Long Term Standards are designed to provide for the fact that humans can tolerate brief exposures to higher levels of pollutant concentrations, but can suffer adverse health impacts from prolonged exposure to lower concentrations of pollutants.

Short Term Standards set limits for concentrations over one-hour, 8-hour, and 24-hour periods.

Long Term Standards set limits for concentrations on an annual basis (*AAM*).

National Ambient Air Quality Standards
(as of November 15, 1990)

POLLUTANT	VALUE	TYPE
Ozone		
1-hour average	0.120 ppm (235 μg/m^3)	Primary & Secondary
Carbon Monoxide		
8-hour average	9 ppm (10 mg/m^3)	Primary
1-hour average	35 ppm (40 mg/m^3)	Primary
Particulate Matter (PM-10)		
24-hour average	150 μg/m^3	Primary & Secondary
annual arithmetic mean	50 μg/m^3	Primary & Secondary
Sulfur Dioxide		
24-hour average	0.140 ppm (365 μg/m^3)	Primary
annual arithmetic mean	0.03 ppm (80 μg/m^3)	Primary
3-hour average	0.500 ppm (1304 μg/m^3)	Secondary
Nitrogen Dioxide		
annual arithmetic mean	0.053 ppm (100 μg/m^3)	Primary & Secondary
Lead		
quarterly average	1.5 μg/m^3	Primary & Secondary

6.6 The Report Menu

- Print Emission Report
- Print Dispersion Report

6.6.1 Print Emission Report

To print the results of the *emissions inventory*, select Reports/Print Emission Report from the pulldown window. The report will be printed using the configuration specified under the File/Print Setup pulldown menu.

Four types of emissions reports will be printed:

1. A summary report with all *pollutant* totals displayed for each source.
2. An Aircraft Emissions report for all aircraft configurations in the study.
3. A Vehicular Emissions report for all vehicle types in the study.
4. A Stationary Source Emissions report for all stationary sources in the study.

6.6.2 Print Dispersion Report

To print the results of the dispersion run, select Reports/Print Dispersion Report from the pulldown window. The report will be printed on the printer using the configuration specified under the File/Print Setup pulldown menu.

The dispersion report displays pollutant concentrations in $\mu g/m^3$ and in parts/million (ppm) for the highest five concentrations in each standard (1 hour *CO*, 8 hour CO, 24 hour SOx, 24 hour PM-10, and *AAM* for *NOx*, *SOx*, and *PM-10*).

6.7 The Utilities Menu

- Add/Create Aircraft
- Load Weather Files
- Export/Import Profiles

6.7.1 Add/Create Aircraft

The Add/Create Aircraft Window

The Add/Create Aircraft window (Figure 6-24) allows you to create custom *aircraft types* to supplement the conventional types currently available as part of the EDMS database. In creating a custom aircraft type, you will need to specify certain characteristics of the custom aircraft type for use in emissions and dispersion analyses. These characteristics include Number of Engines, *Time In Mode*, and *Engine Emission Factors*. Once created, your custom aircraft type will be available for selection under the Emissions/*Aircraft Activity/LTO Cycles* dialog, as well as the full range of *GSE/AGE/APU* and *Aircraft runway, taxiway, and gate assignments*.

As in all EDMS dialog windows, pressing the Apply button allows you to record your changes without exiting the window but does not save them. To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

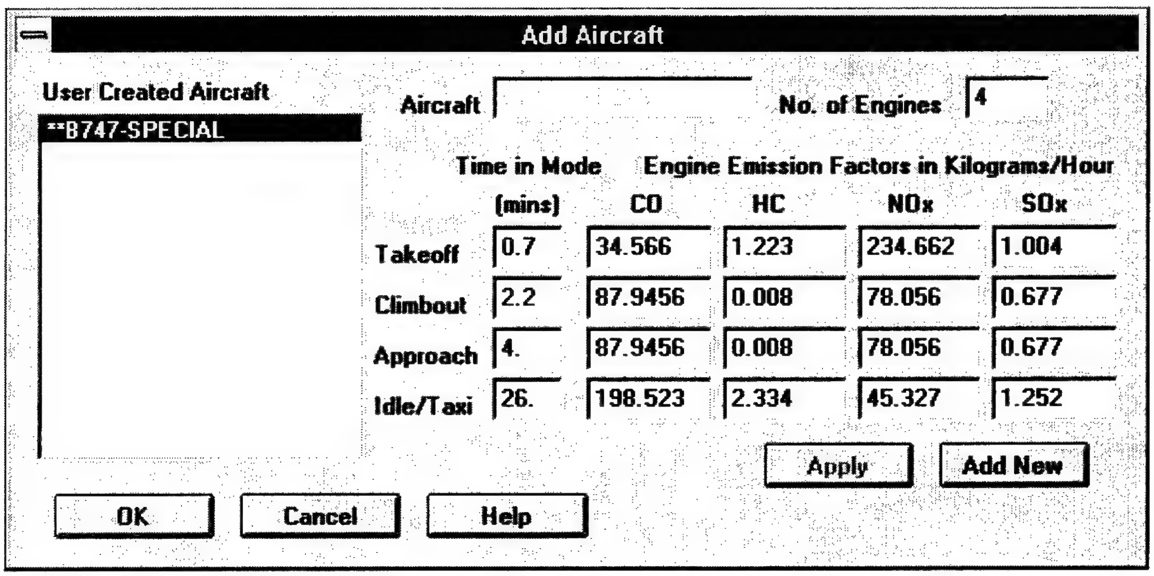


Figure 6-24: The Add/Create Aircraft Window

Adding/Creating a New Aircraft Type

To add a new aircraft type to the list of aircraft types available for use in the study, press the Add New button and type in the name of the new aircraft. Next, enter the number of engines for the new aircraft type. You will need to specify *Time in Mode* information (Takeoff, Climbout, Approach, Taxi/Idle) for the new aircraft type, as well as Engine *Emission Factors* (CO, HC, NOx, and SOx). Emission Factors for many *engine types* are displayed under the *View/System Tables* pulldown menu.

Once added, a new aircraft type will be listed among the available aircraft and can be used in the study like any other available aircraft type.

Editing a New Aircraft Type

Most fields may be edited by simply selecting the field and typing in the new information, and pressing OK. This is true for editing the Number of Engines, Time in Mode, or Engine

Emission Factors information. However, once created, a new aircraft type cannot be deleted. It will always remain in the system aircraft database for your copy of the software.

6.7.2 Load Weather Files

The Load Weather Files Window

The Load Weather Files window (Figure 6-25) allows you to import weather data files from the National Climatic Data Center (NCDC). EDMS requires that weather data be obtained directly from NCDC in the WBAN Hourly Surface Observations TD-1440 format. Since EDMS requires a full year's data (12 consecutive months in a calendar year), make sure you order and load a full calendar year of weather files (1 file = 3 months) from NCDC.

NCDC weather data files can be obtained by writing or calling:

National Climatic Data Center
151 Patton Avenue, Room 120
Asheville, NC 28801-5001
(704) 271-4800

Loading Weather Files

To load your TD-1440 files, select Utilities/Load Weather Files from the pulldown menu. When the Verify Latitude/Longitude window appears, you will have an opportunity to confirm the airport *latitude* and *longitude* coordinates for your airport. These coordinates are used in the calculation of the *Pasquill Gifford Stability Classification.* After you have verified the airport coordinates, press OK. To exit this window without loading weather files, press Cancel.

On pressing OK, the NCDC Files Location window will appear. Select the directory where you have stored your weather files, then enter the 5 digit station number (which corresponds to the weather file name) and press OK.

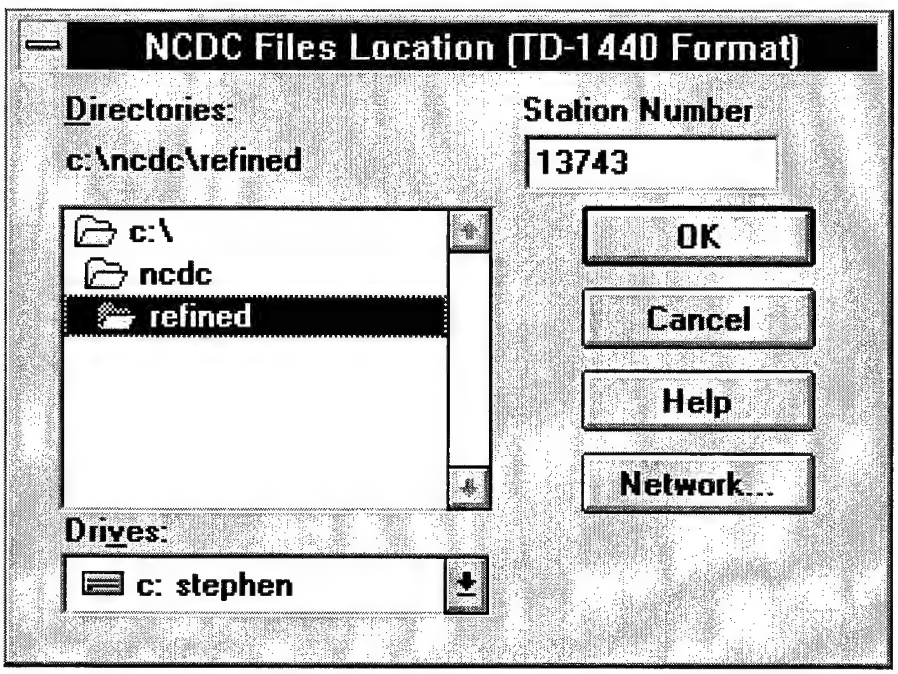


Figure 6-25: The Load NCDC Files Window

When the weather file has been completely loaded, it will appear in the File drop down menu of the Dispersion/*Meteorology* dialog window, and in the Weather File drop down menu of the *Run Dispersion* dialog window.

6.7.3 Export/Import Profiles

The Export/Import Operational Profiles Window

The Export/Import Operational Profiles window (Figure 6-26) allows you to import hourly, daily, or monthly *operational profiles* datafiles for use in your study. It also allows you to export hourly, daily, or monthly operational profiles created in your study for subsequent use or modification. File formats for importing files are tab delimited, as are the formats of exported files.

To save your changes and exit the window, press OK. To exit the window without saving changes, press Cancel.

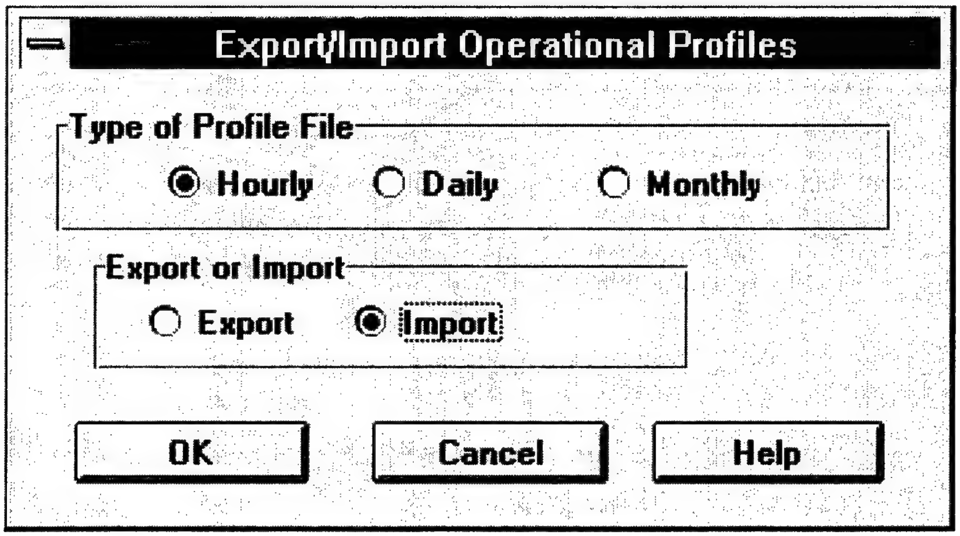


Figure 6-26: The Export/Import Operational Profiles Window

Exporting Operational Profiles

To export hourly, daily, or monthly *operational profiles*, select Utilities/Export/Import Profiles from the pulldown menu. When the Export/Import Operational Profiles window appears (Figure 6-26), use the radio buttons to select the Type of Profile (*Hourly*, *Daily*, or *Monthly*), and then click on the Export radio button, and press OK. When the Exporting Operational Profiles window appears (Figure 6-27), type in an eight character file name using the **.txt** extension supplied by EDMS, select the directory you wish to use, and press OK. To exit this window without saving, press Cancel.

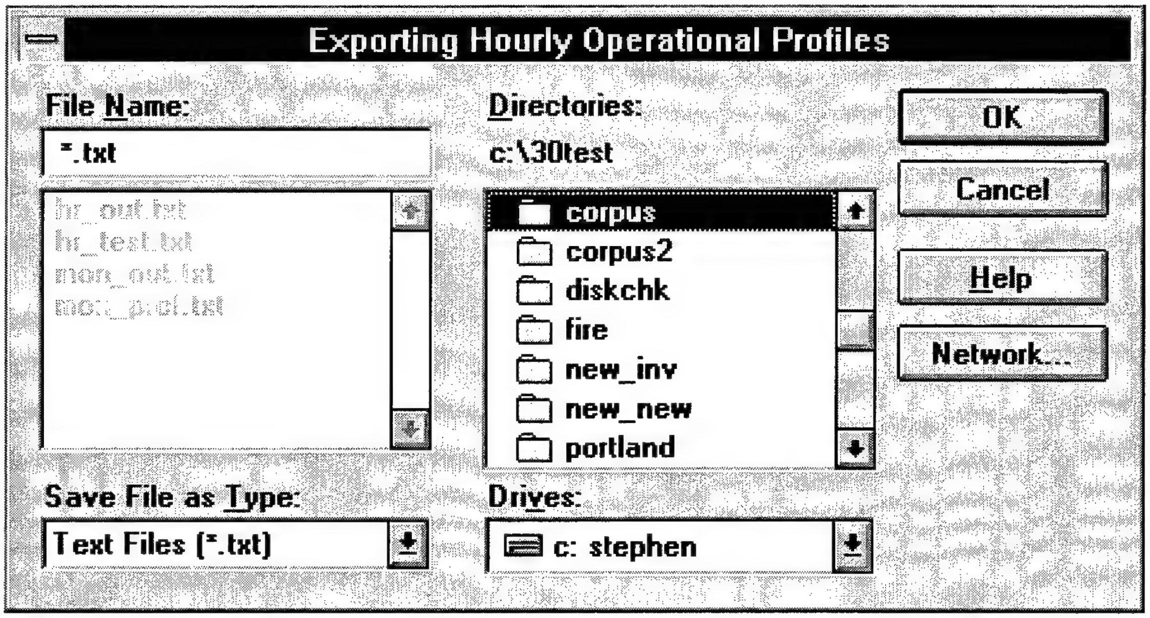


Figure 6-27: The Exporting Hourly/Daily/Monthly Operational Profiles Window

Importing Operational Profiles

To import hourly, daily, or monthly *operational profiles*, select Utilities/Export/Import Profiles from the pulldown menu. When the Export/Import Operational Profiles window appears (Figure 6-26), use the radio buttons to select the Type of Profile (*Hourly*, *Daily*, or *Monthly*), and then click on the Import radio button, and press OK. When the Importing Operational Profiles window appears (Figure 6-28), locate and select the name of the file you wish to import and press OK. To exit this window without saving, press Cancel.

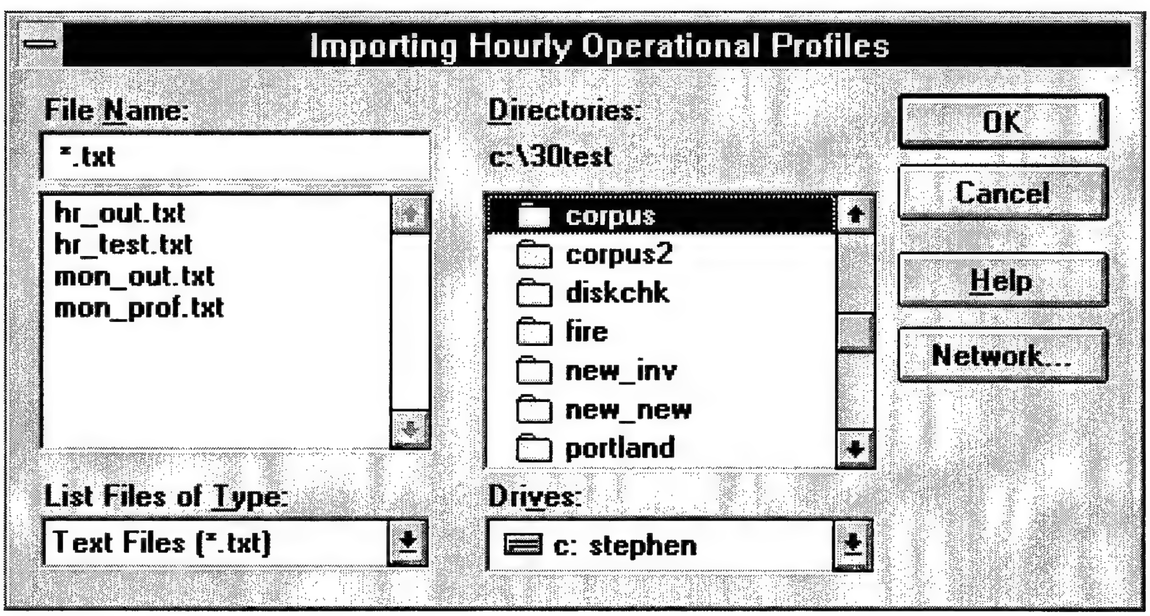


Figure 6-28: The Importing Hourly/Daily/Monthly Operational Profiles Window

6.8 *The Window Menu*

- Cascade
- Tile
- Arrange Icons

6.8.1 Arranging Windows and Icons

You can arrange your display of windows in EDMS for View modules only, since only the View modules allow more than one window at a time to be open. The Cascade command resizes and layers an open group of windows so that each title bar is visible. The Tile command resizes and arranges an open group of windows side by side. When you minimize a window (to an icon), the Arrange Icons command will evenly arrange them in the window.

6.9 Glossary

AAM	The AAM (annual arithmetic mean) is an average of a given set of values over an entire calendar year.
Active Aircraft	An active aircraft refers to an Available aircraft that has been placed In Study.
Aerospace Ground Equipment (AGE)	All emissions producing ground based vehicles and equipment used in support of military aircraft at a gate or aircraft service station (see also Ground Support Equipment).
Aircraft Emission Factors	The rate at which pollutants are emitted into the atmosphere by aircraft during various modes of operation.
Aircraft Operation	An aircraft operation is either a landing or a takeoff for a given aircraft. One LTO cycle equals 2 operations. See also LTO Operations.
Aircraft Time in Mode	As outlined in the EPA *Procedures for Emissions Inventory Preparation, Volume IV*, the EDMS recognizes four aircraft modes that constitute a complete landing and takeoff (LTO) cycle: takeoff, climbout, approach, and taxi/idle. The Aircraft Time in Mode is the time, in minutes, a specific aircraft spends in any one of these modes during an LTO cycle. Of the four modes the taxi/idle mode is the most variable due to its airport specific nature and accordingly the time may be modified by the user. The approach and climb out time will vary depending on the mixing height. The time-in-mode for takeoff is the least variable and hence there is no modification of this time within the model.
Aircraft Type	Aircraft type refers to the airframe plus the engine type assigned to it.
Airport Designator	The 3-character identifier of the airport.
Airport Layout Units	The units of measure (metric or English) in which study results are reported. Changes to Airport Layout Units only affects measures of area (length, width, height). Concentrations and measures of rate remain in metric units; vehicle speeds remain in English units.
Airport Name	The full, unabbreviated name of the airport
Area Source	The agglomeration of many sources that have low emission rates spread over a large area, that are too numerous to treat individually. In the EDMS motor vehicle parking lots are treated as area sources.

Atmospheric Stability	Atmospheric stability is a measure of turbulence or vertical movement of air or a measure of the ability of the atmosphere to dilute and mix air. Several factors determine the atmospheric stability; these include wind speed, cloud cover, temperature, and solar insolation. However, the mechanical effects of wind (wind shear and turbulent mixing) can dominate the thermal mixing effects. The EDMS uses the Pasquill-Gifford stability classification, see Pasquill-Gifford Stability Classification.
Auxiliary Power Units	Auxiliary power units (APU) are typically on-board generators, very similar to a small jet engine, that provide electrical power to the aircraft while its engines are shut down. External APUs similar to an electrical generator may also be used. In the absence of an APU a combination of 400 Hz electric power and preconditioned air (PCA) must be supplied to the aircraft at each gate to allow normal operation.
Available Aircraft	Available aircraft consist of types of airframes currently included in the EDMS database.
Average Distance Traveled	Average Distance Traveled refers to the average distance a vehicle traverses as it travels through a parking lot.
Average Idle Time	Average Idle Time refers to the average amount of time a vehicle spends at idle in a parking lot.
Average Yearly Temperature	User specified average yearly temperature.
Carbon Monoxide (CO)	A colorless, odorless, toxic gas produced by the incomplete combustion of organic materials used as fuels. CO (molecular weight 28) is emitted as a by-product of essentially all combustion. Idling and low speed mobile source operations, such as aircraft taxi and motor vehicle idle, are the most prevalent CO emissions sources commonly found at airports.
Category	Category refers to the category of stationary source. Currently, the five standard stationary sources categories are Incinerator, Power/Heat Plant, Fuel Tank, Solvent Degreaser, and Surface Coating. For unspecified source types, choose Other.
Clean Air Act (CAA)	The Federal law regulating air quality. The first Clean Air Act (CAA), passed in 1967, required that air quality criteria necessary to protect the public health and welfare be developed. Since 1967 there have been several revisions to the CAA.
Clean Air Act Amendments of 1990 (CAAA)	The Clean Air Act Amendments of 1990 (CAAA) represent the fifth major effort to address clean air legislation. Revisions include significant strengthening of the Clean Air Act, especially by adding detailed requirements for Federal actions to conform to State Implementation Plans (SIP), strengthening the operating permit program, the establishment of deadlines to reduce air pollution, and the tightening of emissions standards on mobile sources.

Coordinates	The x,y coordinates are used to spatially locate entities such as runways, parking lots, receptors, etc. In EDMS, the x,y coordinates are based on a Cartesian coordinate system, such that the x axis runs East/West, and the y axis runs North/South.
Criteria Pollutants	The six pollutants listed in the CAA that are regulated by the EPA through the National Ambient Air Quality Standards because of their health and/or environmental effects. They are: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), particulate matter (PM-10), and lead (Pb).
Default Engine	The default engine is the most represented engine type (greatest market share) used with the airframe you selected. While all airframes have at least one engine type to choose from, it has not been possible to identify a default engine for every airframe due to a lack of data.
Dispersion Analysis	Dispersion is a term used to describe the spreading out of a plume of air pollution. A dispersion analysis calculates concentrations of pollutants at receptor locations given emission factors, source location, emission duration, meteorological, and topographical variables.
Elevation	Airport elevation in feet above sea level.
Emissions	Discharge of pollutants to the atmosphere.
Emission Factor	An emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. These factors are usually expressed as the weight of pollutant divided by a unit weight, value, distance or duration of the activity emitting the pollutant (e.g., kilograms of carbon monoxide emitted per hour of engine operation).
Emissions Inventory	A listing of the total amounts of pollutants generated by all sources included in the study for the duration of a complete year.
Engine Type	The available engine types are those commonly used with a given airframe.
Fuel Type	Fuel Type refers to the type of fuel being used for the training fire. Currently the available fuel types are JP-4, JP-8, and Propane.
Gas Velocity	Gas Velocity refers to the velocity (in meters/second) at which emissions enter the atmosphere.
Gate	A gate is the point of arrival and departure for aircraft. In EDMS, the gate serves as a spatial location for GSE/AGE and APU emissions in dispersion calculations.

Gaussian Model	The Gaussian model is a dispersion model used to predict the downwind concentration of a non-reactive pollutant released steadily from an elevated point source. The Gaussian model is essentially a statistical model that computes a concentration at a specific point by taking into account the emissions rate, horizontal and vertical plume spread parameters, distance, atmospheric stability, wind speed, temperature, and effective source release height.
Grid Name	Grid Name refers to the name given to designate a grid of receptors much as parking lots and roadways are given identifying names elsewhere in EDMS.
Ground Support Equipment (GSE)	All emissions producing ground based vehicles and equipment used in support of civilian aircraft at a gate (see also Aerospace Ground Equipment).
Hydrocarbons (HC)	Hydrocarbons is a term used to refer to emissions and emission factors of compounds of carbon excluding methane, ethane, and non-reactive compounds. The HC emission factors in the EDMS mostly represent incomplete combustion of gasoline and the evaporation of petroleum fuels. See also Volatile Organic Compounds (VOC).
Inversion	A thermal gradient created by warm air situated above cooler air. An inversion suppresses turbulent mixing and thus limits the upward dispersion of polluted air.
LTO Cycles	A landing and takeoff (LTO) cycle consists of 2 aircraft operations: one landing operation and one takeoff operation. See also Aircraft Operations.
Latitude	Airport latitude in DD-MM-SS.xxx (North/South).
Lead (Pb)	One of the NAAQS criteria pollutants, lead is a bluish-white metallic element that exists in the atmosphere typically as lead oxide aerosol or lead dust. The chief source of lead pollution at airports and air bases is combustion of leaded aviation gasoline in piston-engined aircraft.
Line Source	A long, narrow source of emissions. The EDMS treats roadways, runways, aircraft queues, and aircraft taxiways as line sources.
Local Meteorology	The weather conditions, temperature, wind velocity, mixing height, cloud cover, etc., that exist in a particular area.
Longitude	Airport longitude in DD-MM-SS.xxx (East/West).
Meteorological Variables	Wind speed and direction, mixing height, temperature, pressure, degree of turbulence, sunlight intensity, humidity, and precipitation.
Metric Tonne	A measure of weight equal to 1000 kilograms, or 2,204.62 pounds.

$\mu g/m^3$	Micrograms per cubic meter.
Mixing Height	The vertical distance between the earth's surface and the height to which convectional movements within the atmosphere extend--typically a few thousand feet. See also "inversion" Mixing Height data may be obtained from NOAA or the National Weather Service.
MOBILE5a	MOBILE5a is the Environmental Protection Agency's tool used to estimate mobile source emissions of CO, VOCs, and NO2. The program consists of a large database controlled by a FORTRAN program and calculates emission factors for eight vehicle types based on a number of variables such as calendar year, ambient temperature, average speed, the vehicle fleet mix, engine operating temperature at start-up, altitude of operation, specific inspection and maintenance plans, use of catalytic converters, etc. For the purposes of vehicle movement on roadways and parking lots the EDMS uses composite or weighted average emission factors (based upon a default fleet mix) generated from MOBILE5a based upon the variability of temperature, altitude, fleet year, and vehicle speed, defaults being used for the other parameters.
Model	A quantitative or mathematical representation, or simulation, which attempts to describe the characteristics and/or relationships of physical events.
NOx (Oxides of Nitrogen)	The primary combustion product of nitrogen is nitrogen dioxide, NO_2 (molecular weight 46). However, several other nitrogen compounds or oxides are usually emitted at the same time such as nitric oxide, nitrous oxide, etc. These oxides are usually in a rapid state of flux, with NO_2 being, in the short term, the ultimate product emitted or formed shortly downwind of the source. Takeoff and climbout are the significant NOx producing modes of aircraft operation. The EDMS calculates NOx concentrations in units of micrograms per cubic meter and parts per million.
Number of Vehicles	Number of Vehicles refers to the total number of vehicles producing emissions.
Operations	Operations is a general term used to refer to the activity of an emissions source. For example, a power plant's operations may be expressed in terms of tons of coal burned.
Operation Time	Operation Time refers to the estimated duration of GSE/AGE or APU operation for one LTO cycle.
Ozone (O_3)	One of the NAAQS criteria pollutants, Ozone is an unstable, highly reactive free radical of oxygen formed in the atmosphere through electrical discharge or through reaction in the presence of sunlight with VOCs or NOx.

PART5	PART5 is the Environmental Protection Agency's tool used to estimate mobile source emissions of particulate matter (PM, PM-10) and SO_2. Its makeup and use are very similar to the MOBILE5a tool.
Pasquill-Gifford Stability Classification	Pasquill's method (1974) of classifying atmospheric stability based on solar insolation and wind speed. The stability classifications range from A (1) - F (6): very unstable - stable. Usually, stable conditions occur at night with a clear sky and low wind speeds. The opposite is true for unstable conditions, these usually occur during the day with cloudy skies and high wind speeds.
Peak Day	Peak day represents the day(s) of highest activity for a given source.
Peak Hour	Peak hour represents the hour(s) of highest activity for a given source.
Peak Hour Operations	For a specific emissions source the Peak Hour Operations figure refers to the maximum, or most, number of operations that will occur in any one hour time period during the course of an entire year.
Peak Month	Peak month represents the month(s) of highest activity for a given source.
PM-10	One of the NAAQS criteria pollutants, PM-10 consists of matter, 10 micrometers or less in diameter, emitted from sources (due to incomplete combustion) as solid, liquid, and vapor forms, but existing in the ambient air as particulate solids or liquids.
Point Source	A pollutant source that is fixed to the ground and that releases pollutants through a relatively small area. The EDMS treats ground support equipment at gates and all stationary sources (including training fires) as point sources.
PPM (parts per million)	Concentration of a pollutant expressed in parts per million (10^6) by volume. PPM is related to $\mu g/m^3$ (micrograms per cubic meter) as: ppm = $\mu g/m^3$ / (MW x 40.91), where MW is the molecular weight of the molecule.
Queue	A spatially defined line source in the EDMS coordinate system for the purpose of calculating dispersion due to aircraft waiting to enter the runway. A time in minutes is associated with each queue for the average time an aircraft spends in that queue.
Receptor	A specific spatial point in the EDMS coordinate system at which pollutant concentrations, due to emissions sources, are estimated by the dispersion algorithms.

Receptor Height	The height above ground at which a pollutant concentration is to be estimated. The recommended receptor height is the average breathing height for a person--about 1.8 meters. The value for receptor height should not be used to model non-simple terrain.
Receptor Spacing	Receptor Spacing refers to the distance between receptors in a grid. The number of receptors in a grid is a function of area (x,y coordinates) and density (receptor spacing).
Roadway Length	Roadway Length refers to the length (in miles) of the roadway you are adding. Roadway length is in miles regardless of the layout units chosen under Setup.
Runway	A spatially defined line source in the EDMS coordinate system for the purpose of calculating dispersion due to aircraft takeoffs. Based upon the direction of movement along this line, each end of the line is treated as a specific runway.
Screening Technique	A relatively simple analysis technique to determine if a given source is likely to pose a threat to air quality. Concentration estimates from screening techniques are conservative.
Simple Terrain	An area where terrain features are all lower in elevation than the effective release height of the emissions source. EDMS assumes a simple or flat terrain.
Source Diameter	Source Diameter refers to the diameter (in meters) of the emissions source at the point the emissions enter the atmosphere.
Source Height	Source Height refers to the height (in meters) at which emissions enter the atmosphere from a given source.
Speed	Speed in this context refers to average vehicle speed in miles per hour for a given roadway. Speed is given in mph regardless of the layout units selected under Setup.
Speed in Lot	Speed in Lot refers to the average speed of the vehicle as it travels through the parking lot.
Stability	See "atmospheric stability" above.
State	Two-letter abbreviation for a U.S. state.
Stationary Source	Stationary sources are non-mobile sources of emissions. For the purposes of dispersion in EDMS, all stationary sources are treated as point sources. See also Point Source.
Study Information	User specified descriptive information about the study.

SOx (Oxides of Sulfur)	The primary product from combustion of sulfur is sulfur dioxide, SO_2 (molecular weight 64). However, other oxidation states are usually formed. Used as an emission factor in EDMS, these compounds are jointly referred to as SOx, or oxides of sulfur. As a result of the low sulfur content of aviation fuel, very little SOx is emitted from any aviation sources.
Taxi Time	Time refers to the length of time an aircraft spends in a taxiway. Taxi Time (total) refers to the total time an aircraft spends in all taxiways and queues for purposes of calculating the aircraft emissions inventory.
Taxiway	A spatially defined line source in the EDMS coordinate system for the purpose of calculating dispersion due to aircraft taxiing. A time in minutes is associated with each taxiway for the average time an aircraft spends in that taxiway while traveling between a runway and a gate.
TD-1440	TD-1440 files are weather files currently used by EDMS as partial sources of data used in dispersion analyses. EDMS utilizes the Wind Direction, Wind Speed, and Dry Bulb Temperature data supplied by the TD-1440 files as well as the derived Pasquill-Gifford Stability Classification in performing dispersion calculations. The Pasquill-Gifford Stability Classification is derived using the Month, Day, Hour, Ceiling Height, and Sky Condition data supplied by the TD-1440 files, plus the latitude data supplied in the File/Setup dialog.
Temperature (meteorology)	Temperature (meteorology) refers to the average temperature, and can be applied for the entire weather data set period, or to individual hours.
Temperature (source)	Temperature in this context refers to the temperature of the source emissions at the time they enter the atmosphere.
Terrain Roughness	Terrain Roughness is a grading of the texture of the land surrounding the roadway and is important in calculating dispersion. Terrain textures range from roughest (forest and apartment buildings) to smoothest (sand), and are graded in density (meters).
Time-in-Mode (TIM)	Time-in-mode is the time (in minutes) that an emissions source spends in a specific mode of operation.
Time in Queue	The length of time an aircraft spends in a takeoff queue (not including time in taxiways).
Touch and Go (TGO)	An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway (used mostly for training). For emissions inventory purposes, a touch and go operation encompasses the takeoff, approach, and climbout modes.
Type	Type refers to the particular stationary source type within a given category.

Type of Roadway	Type of Roadway refers to the elevation of the roadway with respect to the general airport geographical features and is important in calculating dispersion. The four roadway types are: at grade, bridge, depressed and fill. At grade refers to a roadway at the same level as the surrounding land. Bridge refers to a roadway with airspace both above and below (for dispersion purposes). A depressed roadway runs below the general level of the surrounding land. Fill refers to a roadway artificially raised above the level of the surrounding land using an embankment.
Vehicle Emission Factors	Vehicle emission factors, derived from MOBILE5a and PART5, include CO, HC, NOx, SOx, and PM-10 represented in grams/vehicle (Parking Lots) or grams/vehicle-mile (Roadways). Calculations of vehicle emission factors are based on average yearly temperature, elevation, and vehicle fleet year, as well as time and speed and distance traveled.
Vehicle Fleet Year	Vehicle fleet year corresponds to the EPA vehicle emissions factors as projected by MOBILE5a and PART5 for the year specified. Currently these projections are available through 2010.
Vehicle Miles Traveled (VMT)	The sum of distances traveled by all motor vehicles in a specified region. VMT is equal to the number of vehicle trips multiplied by the vehicle distance traveled in miles. This sum is used in computing an emission inventory for motor vehicles.
View Aircraft by Mode	View Aircraft/GSE allows you to view the emissions for each aircraft in all operating modes. The aircraft modes are: Taxi, Takeoff, Climb, Approach, GSE, and APU.
View Aircraft/GSE	View Aircraft/GSE allows you to view the total emissions for all modes by aircraft type, along with GSE, AGE, and APU totals by aircraft type.
View Vehicle Sources	View Vehicle Sources allow you to view emissions generated by roadway and parking lot IDs (names).
Volatile Organic Compounds (VOCs)	Volatile Organic Compounds (VOCs) have been defined by EPA as "any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric chemical reactions." VOCs are required in a State Implementation Plan (SIP) emission inventory. Certain compounds such as methane, ethane, methylene choride, methyl chloroform, many chlorofluorocarbons, and certain classes of perfluorocarbons are exempt from the definition of VOCs because of their "negligible photochemical reactivity." See also Hydrocarbons (HC).

Wind Direction/Wind Angle	Wind Direction/Wind Angle refers to the direction the wind is coming *from*. Wind angles are measured as the azimuth (in degrees) from which the wind is blowing such that a wind blowing from the North=0/360 degrees, from the South=180 degrees, from the East=90 degrees, and from the West=270 degrees.
Wind Speed	Wind Speed, used in dispersion calculations, is expressed (in meters/second) and can be applied to the entire weather data set period, or to individual hours using the Change button.
Wind Speed	Wind Speed is expressed in nautical miles per hour (knots). One nautical mile is 6076.10 feet. In this context, wind speed marks the upper boundary of a range. A wind speed which exceeds the upper limit specified in a configuration will invalidate that configuration for purposes of aircraft assignment and the default assignment values will be used instead.
Yearly Operations	Total number of operations in a year.

Appendix A. EDMS DATA FORMATS

Study Tables

Field Name	Data Type	Field Length
aircraft name*	character	20
aircraft engine id	character	20
GSE name*	character	30
GSE operation time	float	7

Table A-1: User GSE Table

Field Name	Data Type	Field Length
aircraft name*	character	20
aircraft engine name	character	20
approach time	float	6
climbout time	float	6
take off time	float	6
taxi time	float	6
year or hour?	Boolean	1
number of annual operations	integer	12
number of peak hour operations	float	7
number of annual touch and go operations	integer	6
gate name	character	6
runway name	character	3
aircraft taxi1 name	character	20
aircraft taxi2 name	character	20
aircraft taxi3 name	character	20
hourly profile name	character	20
daily profile name	character	20
monthly profile name	character	20
GSE CO rates	float	12
GSE HC rates	float	12
GSE NO_x rates	float	12
GSE SO_x rates	float	12
GSE PM-10	float	12
use configurations?	Boolean	1

Table A-2: User Aircraft Table

Field Name	Data Type	Field Length
training fire name*	character	20
coordinate : X	float	10
coordinate : Y	float	10
height	float	9
hourly profile name	character	20
daily profile name	character	20
monthly profile name	character	20
gallons per year	float	12
gallons per hour	float	9

year or hour?	Boolean	1
fuel type used	character	20
temperature	float	6
diameter	float	5
velocity	float	5
CO (kg/hr)	float	12
HC (kg/hr)	float	12
NO_x (kg/hr)	float	12
SO_x (kg/hr)	float	12
PM-10 (kg/hr)	float	12
in the study?	Boolean	1

Table A-3: Training Fires Table

Field Name	Data Type	Field Length
gate name*	character	6
coordinate : X	float	10
coordinate : Y	float	10
in the study?	Boolean	1

Table A-4: Gates Table

Field Name	Data Type	Field Length
parking lot name	character	20
coordinate: X	float	10
coordinate: Y	float	10
length	float	7
average idle time	float	4
width	float	7
elevation	float	5
average distance traveled	float	7
number of vehicles per year	float	7
number of peak hour vehicles	float	5
year or hour?	Boolean	1
average vehicle speed	character	3
hourly profile name	character	20
daily profile name	character	20
monthly profile name	character	20
emission factor: CO	float	7
emission factor: HC	float	7
emission factor: NO_x	float	7
emission factor: SO_x	float	7

emission factor: PM-10	float	7
did the user modify this data?	Boolean	1
in the study?	Boolean	1

Table A-5: Parking Lots Table

Field Name	**Data Type**	**Field Length**
roadway name*	character	20
coordinate : X1	float	10
coordinate : X2	float	10
coordinate : Y1	float	10
coordinate : Y2	float	10
roadway length	float	7
number of vehicles per year	integer	10
number of peak hour vehicles	integer	5
year or hour?	Boolean	1
vehicle speed	character	3
roadway characteristic	character	2
road surface characteristic	float	6
hourly profile name	character	20
daily profile name	character	20
monthly profile name	character	20
emission factor : CO	float	8
emission factor : HC	float	8
emission factor : NO_x	float	8
emission factor : SO_x	float	8
emission factor : PM-10	float	8
did the user modify the default emission factor	Boolean	1
in the study?	Boolean	1

Table A-6: Roadways Table

Field Name	**Data Type**	**Field Length**
receptor name*	character	20
coordinate : X	float	10
coordinate : Y	float	10
height	float	6
in the study?	Boolean	1

Table A-7: Receptor Table

Field Name	**Data Type**	**Field Length**
runway name*	character	20
coordinate : X1	float	10
coordinate : Y1	float	10
coordinate : X2	float	10
coordinate : Y2	float	10
queue1:X	float	10

queue1:Y	float	10
queue2:X	float	10
queue2:Y	float	10
queue time	float	5
in the study ?	Boolean	1

Table A-8: Runway Table

Field Name	Data Type	Field Length
aircraft taxiway name*	character	20
coordinate : X1	float	10
coordinate : Y1	float	10
coordinate : X2	float	10
coordinate : Y2	float	10
time spent in the taxiway	float	5
in the study ?	Boolean	1

Table A-9: Aircraft Taxiways Table

Field Name	Data Type	Field Length
profile name*	character	20
hour 1	float	5
hour 2	float	5
hour 3	float	5
hour 4	float	5
hour 5	float	5
hour 6	float	5
hour 7	float	5
hour 8	float	5
hour 9	float	5
hour 10	float	5
hour 11	float	5
hour 12	float	5
hour 13	float	5
hour 14	float	5
hour 15	float	5
hour 16	float	5
hour 17	float	5
hour 18	float	5
hour 19	float	5
hour 20	float	5
hour 21	float	5
hour 22	float	5
hour 23	float	5
hour 24	float	5
usage count	integer	2

Table A-10: Hourly Profile Table

Field Name	Data Type	Field Length
profile name*	character	20
Monday	float	5
Tuesday	float	5
Wednesday	float	5
Thursday	float	5
Friday	float	5
Saturday	float	5
Sunday	float	5
usage count	integer	2

Table A-11: Daily Profile Table

Field Name	Data Type	Field Length
profile name*	character	20
January	float	5
February	float	5
March	float	5
April	float	5
May	float	5
June	float	5
July	float	5
August	float	5
September	float	5
October	float	5
November	float	5
December	float	5
usage count	integer	2

Table A-12: Monthly Profile Table

Field Name	Data Type	Field Length
file name*	character	8
attributes	character	10
refined flag	Boolean	1
last used in dispersion?	Boolean	1

Table A-13: Weather (1) Table

Field Name	Data Type	Field Length
hour*	integer	4
Julian*	character	8

temperature	float	6
wind speed	float	6
wind direction	float	5
PG class	integer	1

Table A-14: Weather (2) Table

Field Name	Data Type	Field Length
source name*	character	20
X coordinate	float	10
Y coordinate	float	10
Z coordinate	float	6
category	integer	2
sub-type	integer	2
temperature	float	6
diameter	float	6
velocity	float	6
yearly operations	float	11
hourly operations	float	9
year or hour?	Boolean	1
hourly profile	character	20
daily profile	character	20
monthly profile	character	20
CO (kg/1000)	float	9
HC (kg/1000)	float	9
NO_x (kg/1000)	float	9
SO_x (kg/1000)	float	9
PM-10 (kg/1000)	float	9
solid, liquid or gas	integer	1
in study?	Boolean	1

Table A-15: Stationary Source Table

Field Name	Data Type	Field Length
configuration name*	character	20
runway	character	3
taxi1	character	20
taxi2	character	20
taxi3	character	20
angle start	integer	3
angle end	integer	3
maximum wind	float	5

Table A-16: Configurations Table

Field Name	Data Type	Field Length
category*	character	20
CO tons	float	10
HC tons	float	10

NOx tons	float	10
SOx tons	float	10
PM-10 tons	float	10

Table A-17: Summary Emissions Table

Field Name	Data Type	Field Length
aircraft name*	character	20
engine name	character	20
mode	character	4
CO tons	float	10
HC tons	float	10
NOx tons	float	10
SOx tons	float	10
PM-10 tons	float	10

Table A-18: Aircraft Emissions Table

Field Name	Data Type	Field Length
vehicle source name*	character	20
CO tons	float	10
HC tons	float	10
NOx tons	float	10
SOx tons	float	10
PM-10 tons	float	10

Table A-19: Vehicle Emissions Table

Field Name	Data Type	Field Length
stationary source name*	character	20
CO tons	float	10
HC tons	float	10
NOx tons	float	10
SOx tons	float	10
PM-10 tons	float	10

Table A-20: Stationary Source Emissions Table

Field Name	Data Type	Field Length
receptor name	character	20
coordinate : X	float	10
coordinate : Y	float	10
height	float	6

Table A-21: Dispersion Receptors Table

Field Name	Data Type	Field Length
hour	integer	4
receptor number	integer	4

total CO	float	20
total NOx	float	20
total SOx	float	20
total PM-10	float	20
aircraft CO	float	20
aircraft NOx	float	20
aircraft SOx	float	20
aircraft PM-10	float	20
areas CO	float	20
areas NOx	float	20
areas SOx	float	20
areas PM-10	float	20
roadways CO	float	20
roadways NOx	float	20
roadways SOx	float	20
roadways PM-10	float	20
stationary CO	float	20
stationary NOx	float	20
stationary SOx	float	20
stationary PM-10	float	20

Table A-22: Concentrations Table

Field Name	Data Type	Field Length
hour	integer	4
receptor number	integer	4
8 hour CO	float	20
24 hour SOx	float	20
24 hour PM-10	float	20

Table A-23: Averaged Concentrations Table

Field Name	Data Type	Field Length
hour	integer	4
receptor number	integer	4
NOx AAM	float	20
SOx AAM	float	20
PM-10 AAM	float	20

Table A-24: AAM Concentrations Table

Field Name	Data Type	Field Length
standard	character	16
rank	character	1
Julian hour	character	8
receptor name	character	20
receptor X coordinate	character	9
receptor Y coordinate	character	9
receptor height	character	6
micrograms concentration	character	20
PPM concentration	character	9

Table A-25: Dispersion Report Table

Appendix B. EDMS TUTORIAL

INTRODUCTION

The purpose of this tutorial is to demonstrate the application of the Emissions and Dispersion Modeling System (EDMS). These sample scenarios are fictional and are used to show the working of the model.

Each "hands on" example problem has been included to demonstrate the many features of the EDMS model. After running the example problems, the user can check his or her results against the sample cases distributed with the EDMS software.

This document assumes a working knowledge of the Microsoft® Windows™ environment. Please refer to your Microsoft® Windows™ documentation for further guidance.

CONTENTS

1. A SIMPLE EMISSIONS INVENTORY

1.1 Project Description

This example demonstrates the steps necessary to compute an airport emissions inventory. For our example we are going to look at the Corpus Christi International Airport (CRP). Table 1-1 describes the annual activity of the various aircraft types at CRP, Table 1-2 describes the annual vehicular activity at CRP, and Table 1-3 describes the annual activity of stationary sources operating within the boundaries of CRP.

Table 1-1: Aircraft LTO Cycles

Aircraft Type	Annual LTO Cycles	Touch and Go
Piper Navajo (Cargo)	507	0
F100 Commercial	1,038	0
ATR-72 Commuter	2,665	0
Piper Aztec General Aviation	400	1,200
B-737-300 Commercial	1,583	0
DC-9-30 Commercial	580	0
C-130 Military	600	1,200

Table 1-2: Annual Vehicular Activity

Vehicle Source	Annual no. of Vehicles
A-Lot (parking lot)	780,000
Access Road (roadway)	4,000,000

Table 1-3: Annual Stationary Source Activity

Stationary Source	Annual fuel burned
Airport Power (power plant)	5,000,000 m^3 natural gas
TF 1 (training fire)	12,000 gallons propane

1.2 Procedures

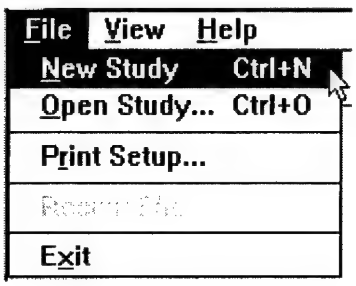
Start EDMS by double-clicking the *Run EDMS* icon in its program group. If you are unfamiliar with the use of the mouse, icons, or program groups, please refer to your Windows™ documentation.

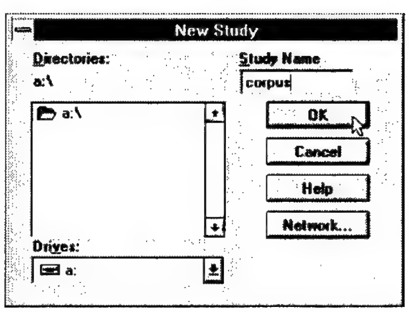
1.2.1 File Menu

1.2.1.1 Setting up the scenario

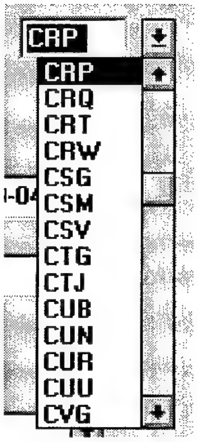
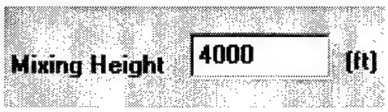
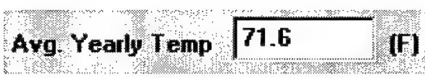
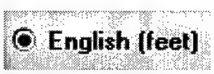
We will begin the tutorial by creating a new scenario, and entering basic descriptive information.

Figure





Action	Result
1. Select *New Study* from the *File* menu.	This brings up the new study box. Here you can select where EDMS will create the directory to hold your data files. You can also name your study. For this example, we have chosen the name CORPUS - the first word of the airport name.
2. Select the directory where you wish to create your new study with its own subdirectory.	As with any Windows™ file selection box, you can choose where you wish to save your files.
3. Type "corpus" in *the Study Name* box	This action creates a directory called *corpus* at the selected location. All information relevant to the study will be saved under this directory.
4. Press *OK*	This saves the information and closes the New Study box. This will also bring up the Study Setup box.

Figure	Action	Result
	5. Select the airport *CRP* from the airport selection box.	This selects Corpus Christi International Airport. Once you have selected an airport, EDMS will fill in the available default airport data which includes the airport location and elevation.
	6. Highlight the default *Mixing Height* value and enter 4000.	If accurate mixing height information is available for your airport, you can replace the default of 3000 feet with a new number. In this case, we are assuming that CRP has an average mixing height of 4000 feet.
	7. Enter 71.6 in the *Avg. Yearly Temperature* box.	We are assuming that the average annual temperature in Corpus Christi is 71.6°F.
	8. Select *English* units.	All the airport layout numbers used in this tutorial are based on English units.
	9. In the *Study Info* box, enter a brief description of the study.	This information is for your use. You should include a brief description of your study so that when you re-visit the file, you will understand the reasons for selecting the inputs you have. In this case we have indicated that we are doing a study of CRP under 1997 activity levels.
		Your completed Study Information window should look like the window in Figure 1-1.
	10. Press *OK*.	This saves the changes entered and closes the setup window.

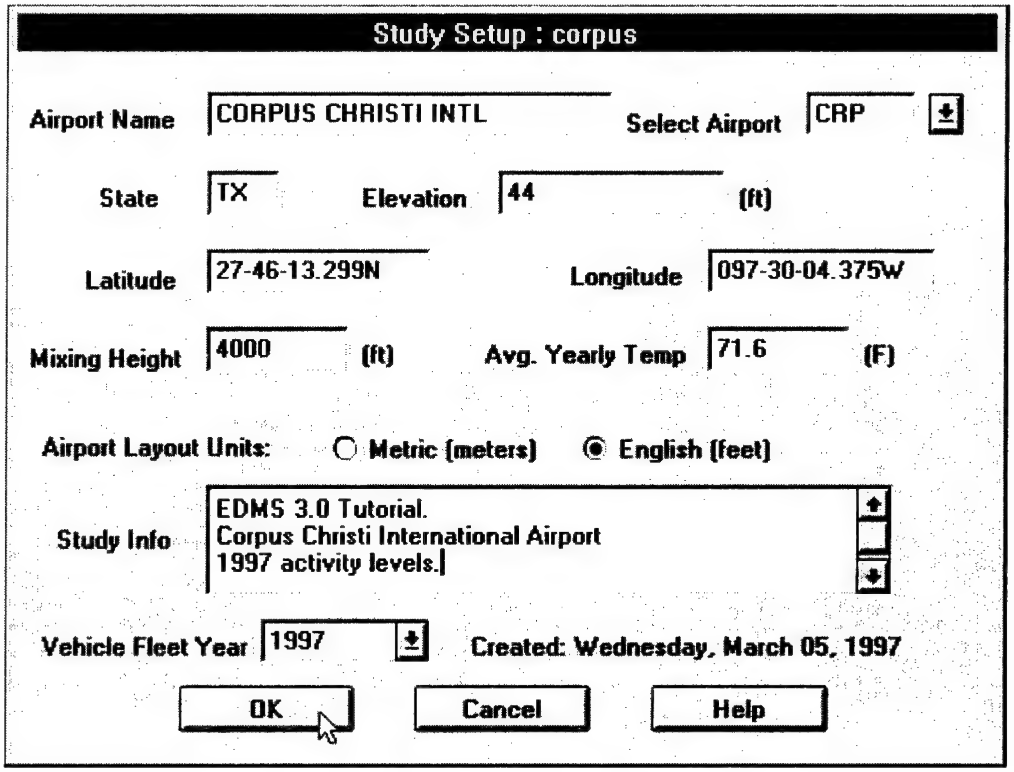
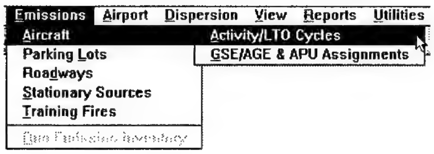
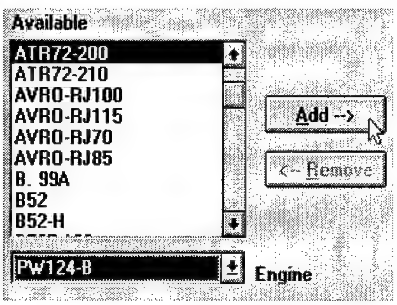


Figure 1-1: The Study Setup Window

1.2.2 Emissions Menu

1.2.2.1 Adding Aircraft

For each of our sources, we must first provide EDMS with information to compute the emissions inventory. We begin by matching engines with aircraft and assigning them to the study.

Figure	Action	Result
	1. Select *Aircraft* from the *Emissions* menu then *Activity / LTO Cycles.*	This brings up a window which allows you to specify information about the aircraft included in the study and their associated activity rates.
	2. Select the aircraft to be used in the study by clicking on the aircraft name as listed in the *Available* list then pressing *Add.* For each aircraft fill in the *Yearly* LTO cycles number with the corresponding number from Table 1-1.	We will be using the aircraft-engine pairs shown on the screen in Figure 1-2 for the tutorial. There are often multiple engines available for each aircraft type. For this tutorial it is important to use the engines shown. Remember to select the aircraft *and* engine before pressing Add.
	3. Press *OK*	This saves all of the changes made to this window.

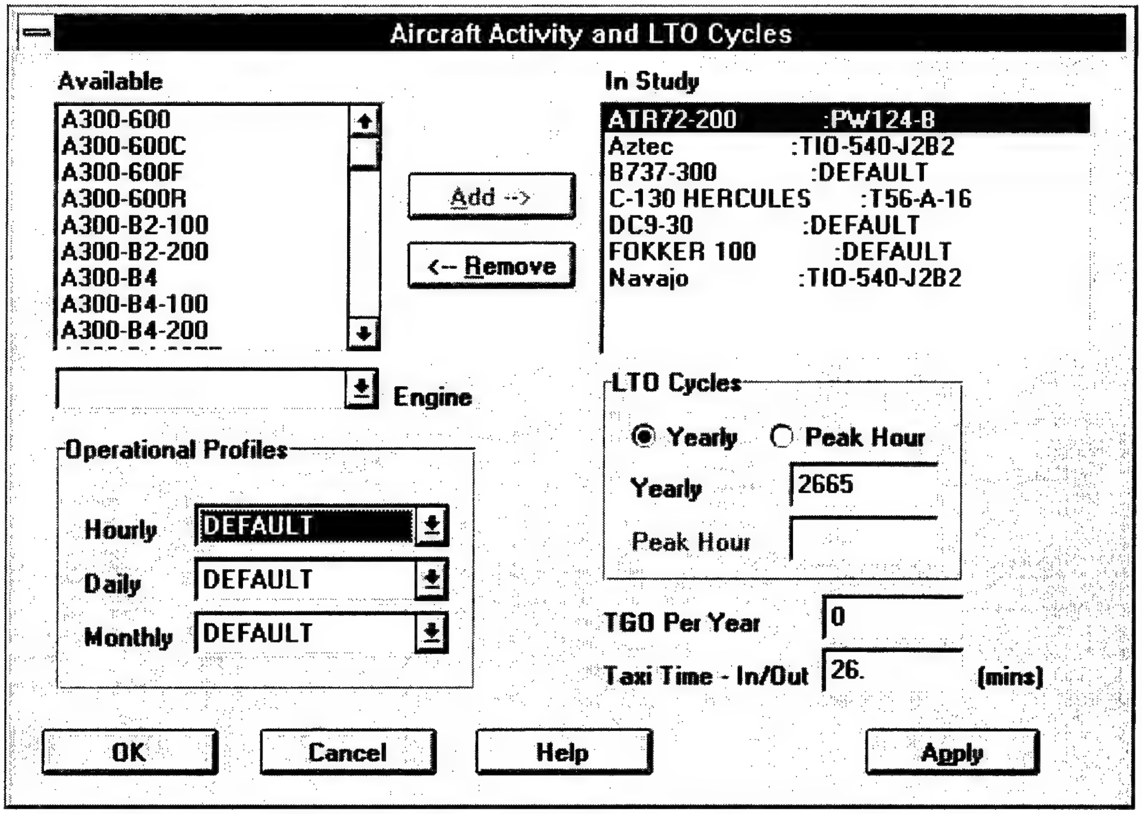


Figure 1-2: Aircraft Activity and LTO Cycles Window

1.2.2.2 Parking Lots

Vehicles in parking lots are a significant contributor to overall emissions near an airport. We are including one parking lot in our tutorial with an annual traffic flow of 780,000 vehicles and an average speed of 15 mph.

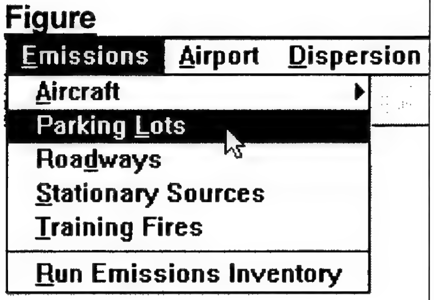
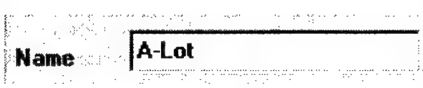
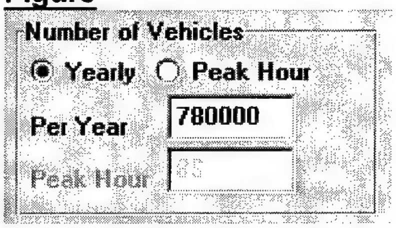
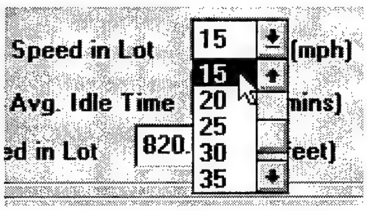
Figure	Action	Result
	1. Select *Parking Lots* from the *Emissions* menu.	This brings up the Parking Lots window where we will specify all of the information about our parking lot.
 	2. Press *Add New* and create a new parking lot called "A-Lot".	This prompts you for the name of the parking lot. We'll call it *A-Lot*.

Figure	Action	Result
	3. Set the *Yearly* number of vehicles to 780000.	This means that during the course of the entire year 780,000 vehicles will use the parking lot.
	4. Set the *Speed in Lot* to 15 mph.	The speed of the traffic within the lot affects the emissions factors.
	5. Leave the *Avg. Idle Time* set to 1.5 minutes and the avg. *Distance Traveled In Lot* set to 820 feet.	Your screen should look like Figure 1-3 when you have finished. The Peak Hour number of vehicles is automatically computed.
	6. Press *Apply*	This creates the new record.
	7. Press *OK*.	NOTE: The bottom half of the screen contains parameters which affect only the dispersion output. These will be addressed in the next example.

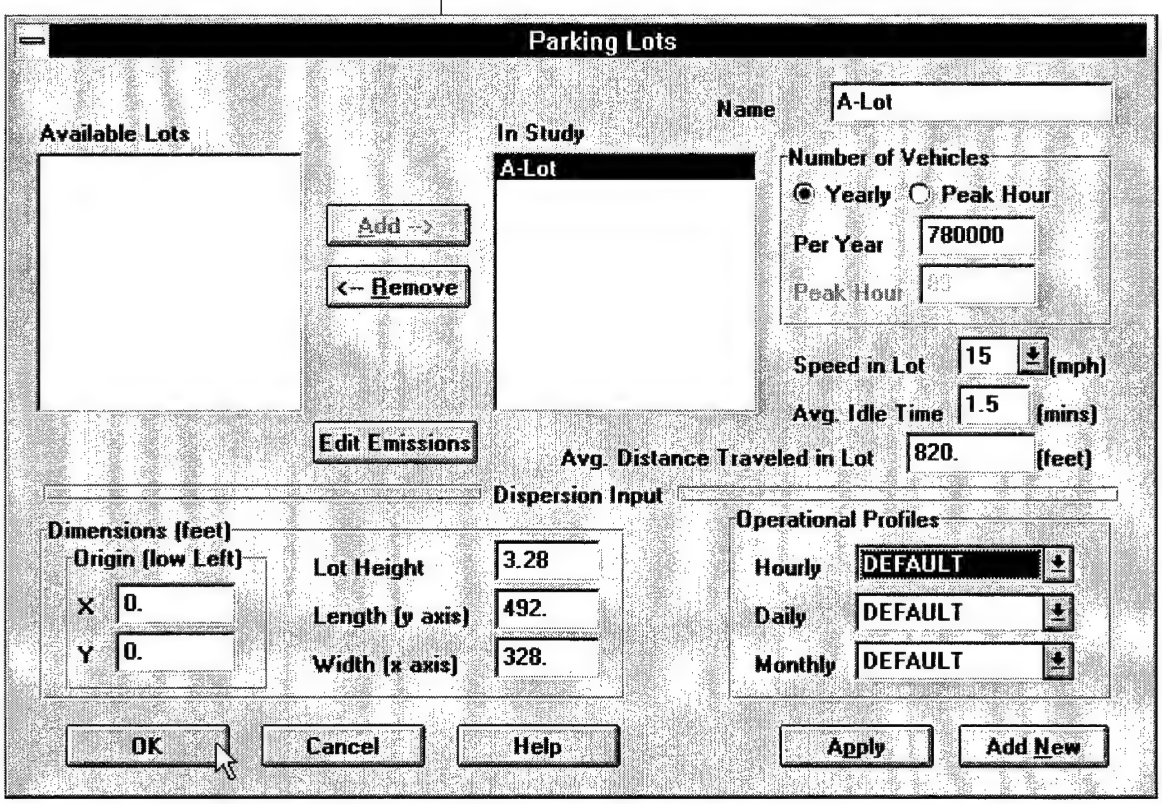
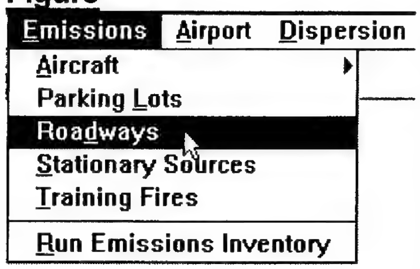


Figure 1-3: Parking Lots Window

1.2.2.3 Roadways

We are now going to add an access road to the airport that is two and a half miles long, and will pass in front of the parking lot.

Figure | **Action** | **Result**

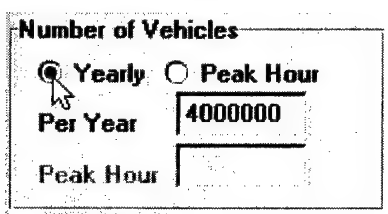


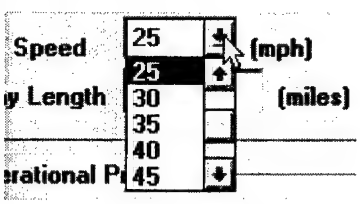
1. Select *Roadways* from the *Emissions* menu.

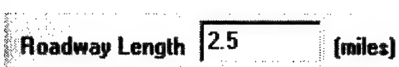
This brings up a window very similar to the parking lots example.

2. Add a new roadway called "Access Road".

This will be our only road to and from the airport.







3. Set the *Yearly* number of vehicles to 4000000, the *Speed* of vehicles on the roadway to 25 mph and the *Roadway Length* to 2.5 miles.

Again, these are the only values required for computing an emissions inventory and as before the peak hour value will be computed automatically.

4. Press *Apply* when you have finished.

Your screen should look like Figure 1-4 when you have finished.

5. Press *OK*

The values are saved.

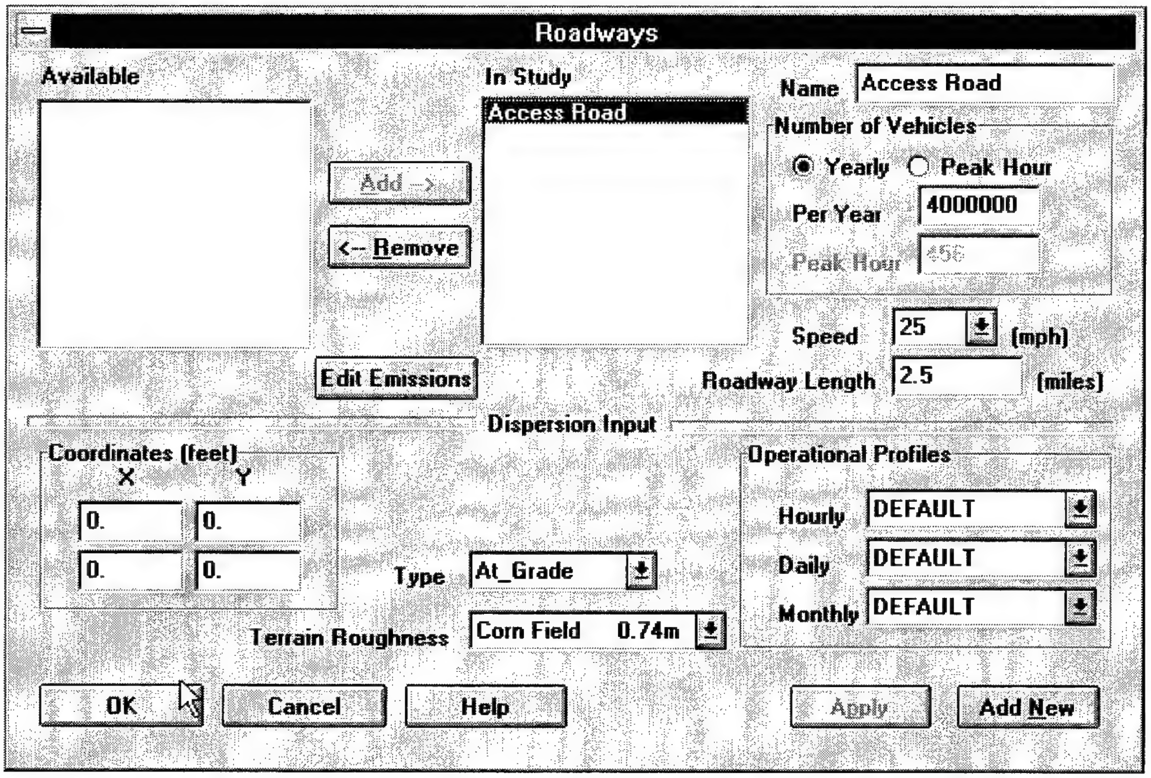
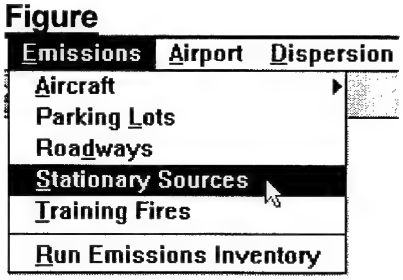


Figure 1-4: Roadways Window

1.2.2.4 Stationary Sources

We are going to add a natural gas-based power plant for our airport. We are assuming that it uses 5,000,000 m^3 of natural gas per year. As with the other sources, we are not yet including dispersion information, so the bottom half of the screen will be left at its default values.

Figure

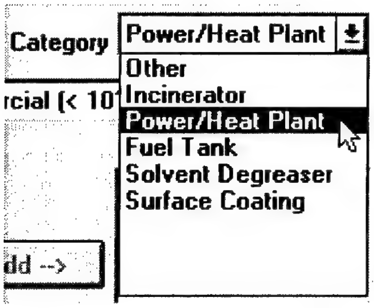
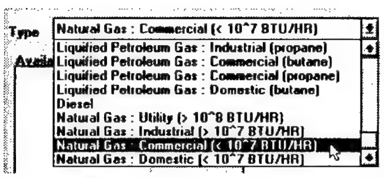


Action

1. Select *Stationary Sources* from the *Emissions* menu.

Result

This brings up the Stationary Sources window where you can add emissions information about stationary sources.

Figure	Action	Result
  	2. Add a new source called "Airport Power" of category *Power/Heat Plant.*	This will be our airport power plant.
	3. Select *Type: Natural Gas: Commercial (< 10^7 BTU/HR).*	The emission rates for this source type are expressed in Kg/m^3 and are displayed on the right.
	4. Finally, enter the *Yearly* amount of gas used. In our case 5000 thousands of cubic meters. Then, press *Apply*.	Our power plant will be added to the list. Your screen should look like Figure 1-5 when you have finished.
	5. Press *OK*	The values are saved.

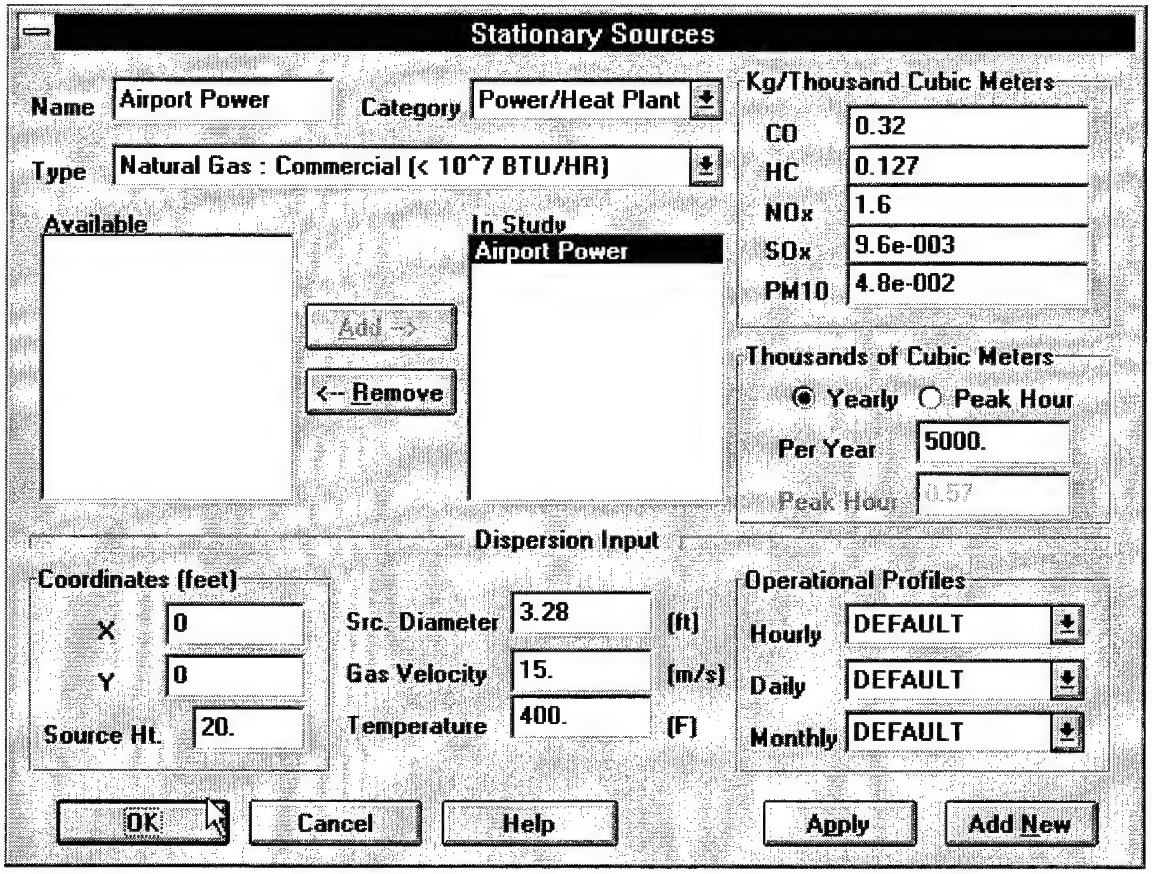


Figure 1-5: Stationary Sources Window

1.2.2.5 Training Fires

We are now going to add a training fire which burns 12,000 gallons of propane during the course of an entire year.

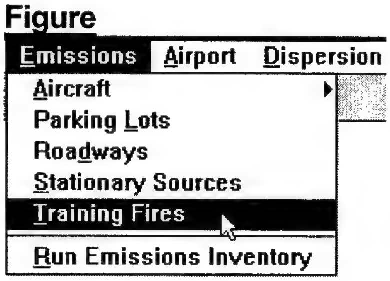
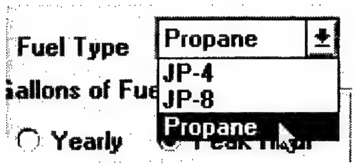
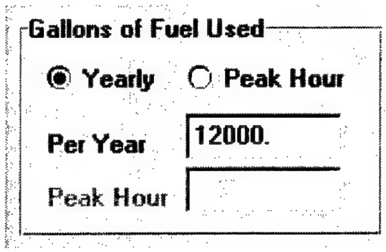
Figure	Action	Result
	1. Select *Training Fires* from the *Emissions* menu.	This brings up the Training Fires window.

Figure | **Action** | **Result**





2. Add a new training fire called "TF 1", with a *Fuel Type* of *Propane*, and *Yearly* gallons of fuel used 12000. Then, press *Apply*.

We are specifying that a total of 12,000 gallons of fuel used will be used over the course of an entire year. As before, the peak hour value will be computed automatically but this value will not be used for the emissions inventory.

As with the other source types, the bottom half of the window is reserved for dispersion information.

Your screen should look like the one below in Figure 1-6.

3. Press *OK*

The values are saved.

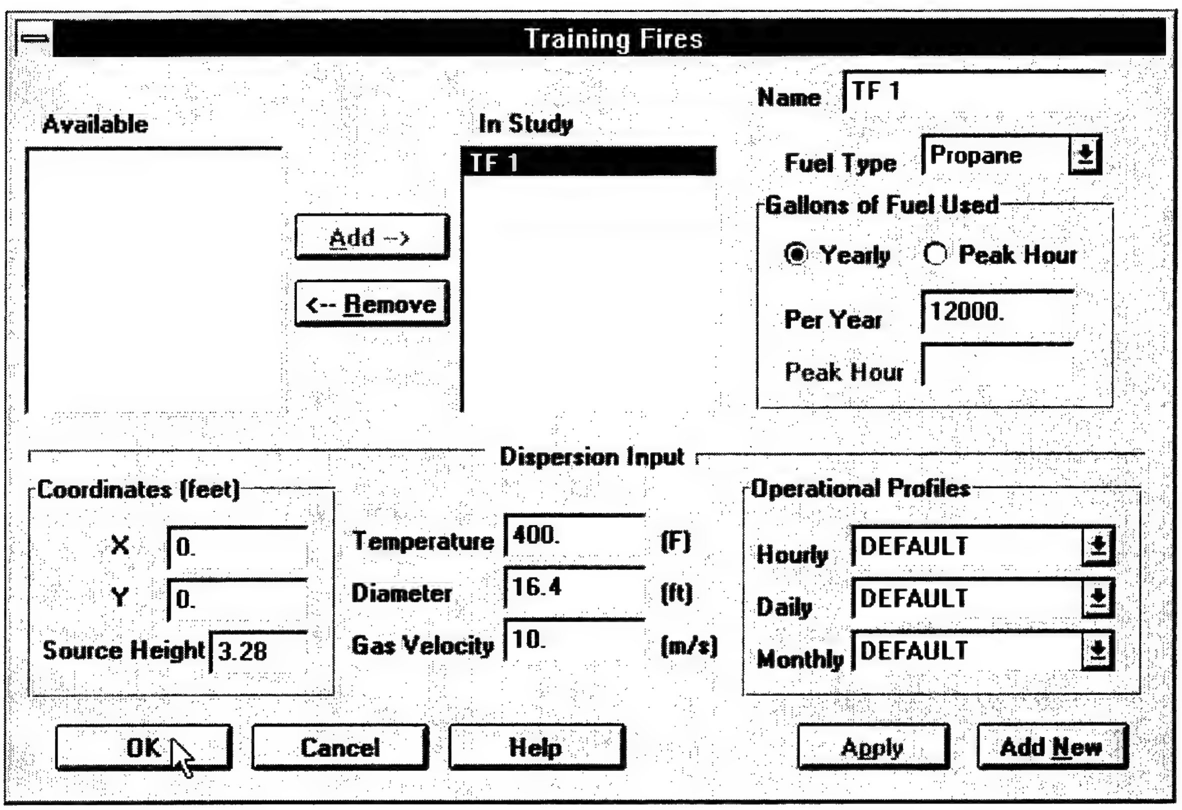
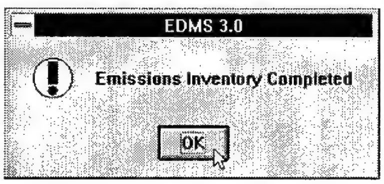
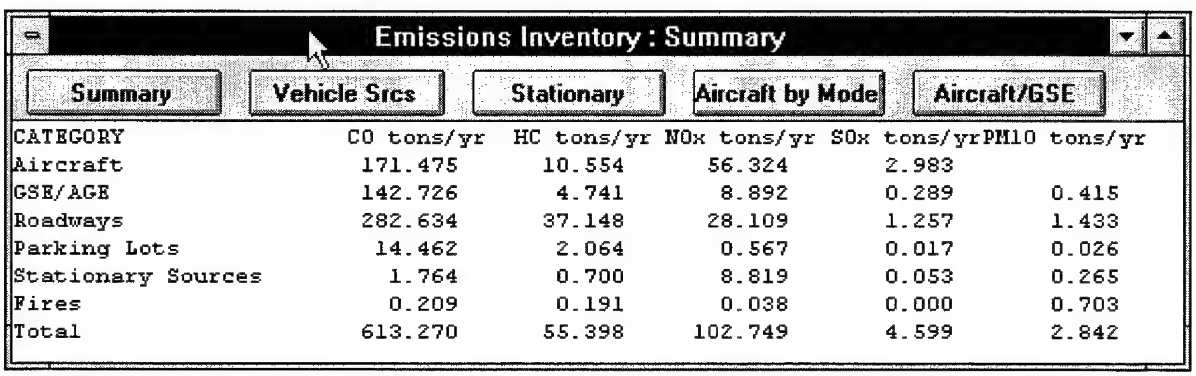


Figure 1-6: Training Fires Window

1.2.3 Results

At this point all of the inputs have been entered into the program. We can now compute an emissions inventory for our scenario. You can compare the results you obtained against the scenario provided with the software.

Figure	Action	Result
	1. Select *Run Emissions Inventory* from the *Emissions* menu.	This should run quickly, since our scenario is not very detailed. A window will be appear when the emissions inventory is complete.
	2. Press *OK*	The results will appear automatically and should be identical to those as shown below in Figure 1-7.



CATEGORY	CO tons/yr	HC tons/yr	NOx tons/yr	SOx tons/yr	PM10 tons/yr
Aircraft	171.475	10.554	56.324	2.983	
GSE/AGE	142.726	4.741	8.892	0.289	0.415
Roadways	282.634	37.148	28.109	1.257	1.433
Parking Lots	14.462	2.064	0.567	0.017	0.026
Stationary Sources	1.764	0.700	8.819	0.053	0.265
Fires	0.209	0.191	0.038	0.000	0.703
Total	613.270	55.398	102.749	4.599	2.842

Figure 1-7: Emissions Inventory View Window

The values listed in this table should correspond to the values on your screen. If they do not, please check your inputs against those listed in the example.

2. A SAMPLE DISPERSION CALCULATION

2.1 *Project Description*

This project is an extension of the previous example. Now that we have successfully computed an emissions inventory for our airport, we will compute pollutant concentrations by applying dispersion algorithms to our emission sources. These algorithms require the specification of several additional parameters such as operational profiles, emissions sources coordinates, receptor placement, and weather data.

2.2 *Specifying dispersion information*

You may wish to work with a copy of your previous study so that the data input and results will remain consistent with the first example. This can be accomplished by using the *Save As…* command from the *File* menu.

2.2.1 Operational Profiles

In this section we will be defining operational profiles that will be used by our aircraft, parking lots, roadways, stationary sources, and training fires.

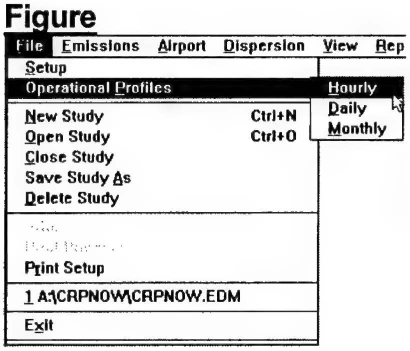
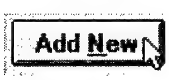
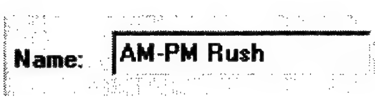
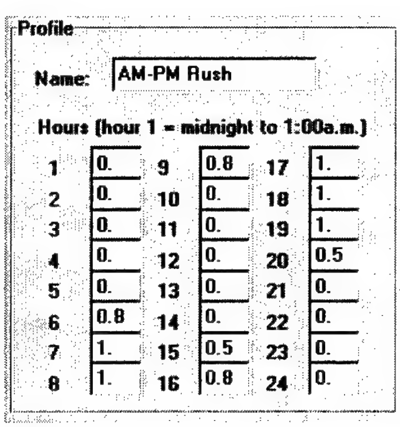
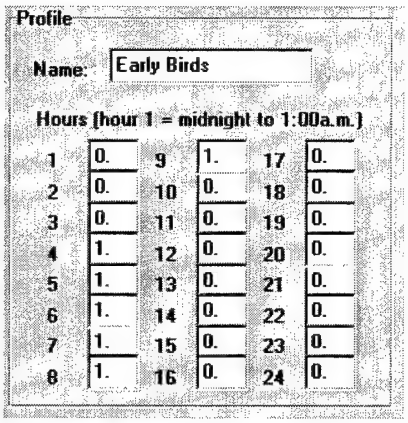
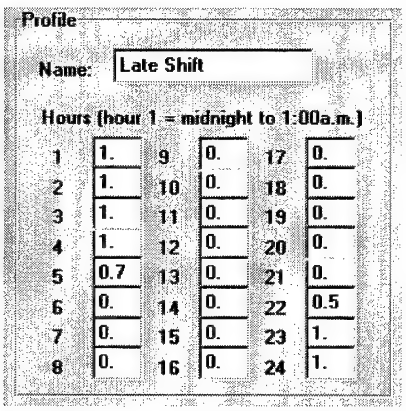
Figure	Action	Result
	1. From the *File* menu, select *Operational Profiles*, then *Hourly*.	This allows us to specify what percentage of peak load is handled on an hourly basis. The hourly profiles box initially appears with a single profile, DEFAULT with all of the hours set to 1.
 	2. Press the *Add New* button and enter a name for the new profile: "AM-PM Rush".	This creates a new profile called AM-PM Rush.
	3. Enter the values as shown in the screen to the left.	We are simulating a peak traffic flow during the morning and afternoon rush hours. These are the peak times for many business travelers.

Figure	Action	Result
	4. Press *Apply*	This makes your changes take effect and places the new profile in the list of available profiles.
 	5. Repeat the process with the other profiles shown to the left.	These will be used later to simulate various types of operations. Make sure that you enter the same numbers shown in the figures, so that your results will agree with the results in this tutorial. The completed window, with the values for "AM-PM Rush" displayed, appears in Figure 2-1. The same process can be repeated for daily and monthly operational profiles, but we will be using the DEFAULT settings in the tutorial.

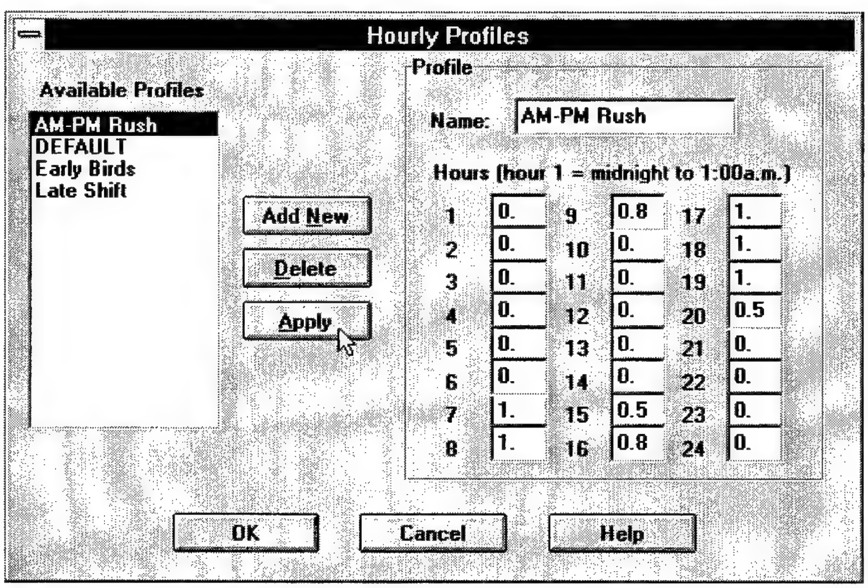


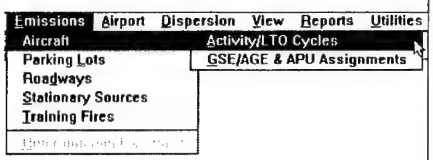
Figure 2-1: Hourly Profiles: AM-PM Rush

2.2.2 Emissions Menu

2.2.2.1 Aircraft Activity

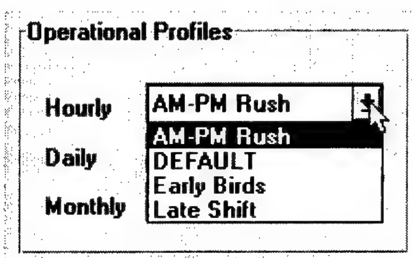
The different aircraft using Corpus Christi airport and the number of their annual LTO cycles was defined in the emissions inventory section. In this section we will be assigning operational profiles to each aircraft type to represent the distribution of that aircraft's activity across the year.

Figure | **Action** | **Result**



1. Select *Aircraft* from the *Emissions* menu then *Activity / LTO cycles.*

This brings up the aircraft activity and LTO cycles window.



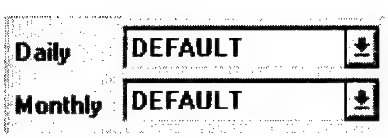
2. Assign *Hourly Operational Profiles* to individual aircraft by selecting an aircraft-engine combination from the *Available* list, then choosing the appropriate profile.

In this case we have essentially four categories of operations: cargo, airline, general aviation, and military. Each one of these categories has a distinct method of operation. For our example, we assume that the busiest time for cargo operators is at night, so we will assign that aircraft type (the Navajo) to the profile "Late Shift."

The same process is repeated for the other aircraft types. The F100, ATR, B737, and DC-9 should all be assigned to the AM-PM Rush profile, since that is when their peak activity will occur.

For our example the military will be training in the morning, therefore the "Early Birds" profile is selected for the C-130.

Finally, the Piper Aztec general aviation airplane is the least likely to follow a set schedule, so the default hourly profile is used.

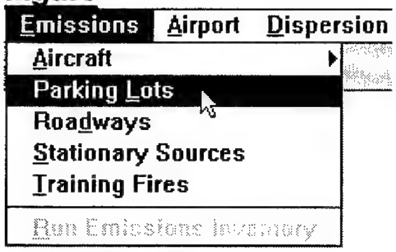
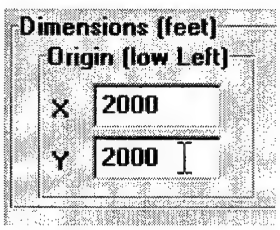
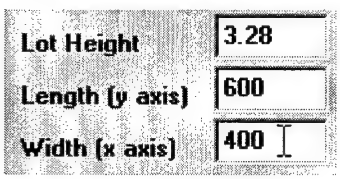
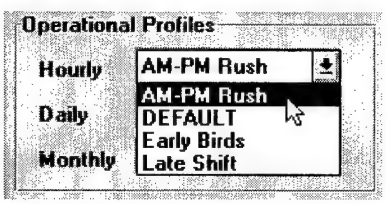


3. The only available *Daily* and *Monthly* operational profiles available is the DEFAULT setting, since no others were previously specified.

Of course, in an actual study it will most likely be desirable to include daily and monthly profiles. We have omitted them for simplicity.

2.2.2.2 Parking Lots

We will begin by placing a parking lot in the northeast quadrant of our analysis area. Based on the annual vehicle activity and peak hour traffic airport planners designed a parking lot with dimensions of 600 by 400 feet. We will also assume that the lot is primarily active during the morning and afternoon rush hours.

Figure	Action	Result
	1. Select *Parking Lots* from the *Emissions* menu.	This time we will need to include the information at the bottom of the window, so that EDMS has enough information to perform dispersion analysis and compute pollutant concentrations.
	2. Select our parking lot, A-Lot, and position the lower left corner (south-west corner) at coordinates (2000,2000).	This assigns the lower left corner point for our parking lot.
	3. Leave the default *Lot Height* at 3.28 feet (1 m), and set the parking lot to be 600 feet long by 400 feet wide.	This creates the parking lot 600' along the y-axis by 400' along the x-axis. The lot height of 3.28 feet indicates a ground level parking height.
	4. Set the *Hourly Operational Profile* to AM-PM Rush.	This specifies that the parking lot will be primarily used during the morning and afternoon rush hours as identified in the profile. Note that the same operational profiles that were used for aircraft can be applied to other areas.
	5. Press *Apply*	Your screen should look like Figure 2-2 when you have finished.
	6. Press *OK*	Your changes will be applied and the window will be closed.

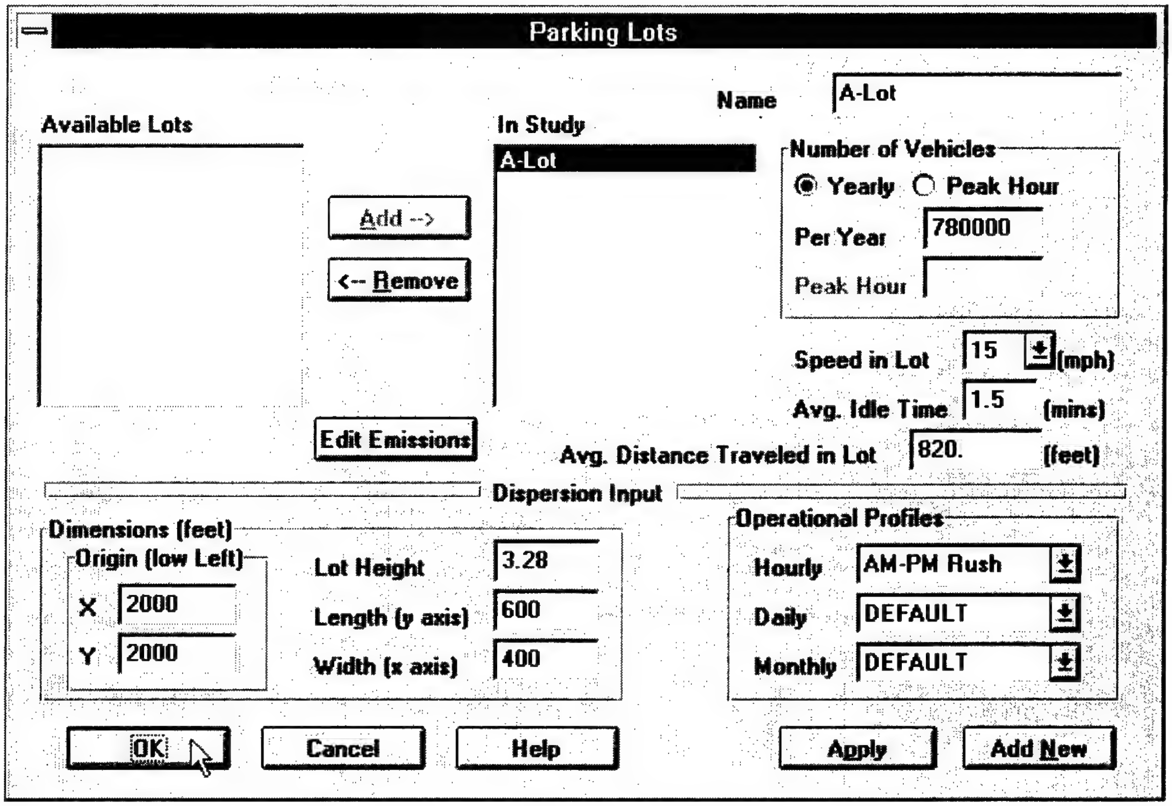


Figure 2-2: Parking Lots Window

2.2.2.3 Roadways

Again, we need to specify the location of our roadway in relation to our other sources. Our road is going to run in front of the parking lot.

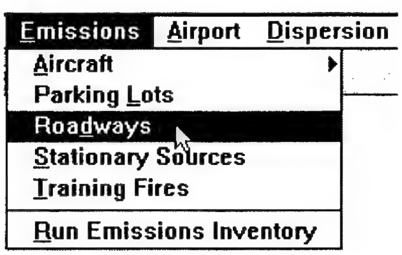
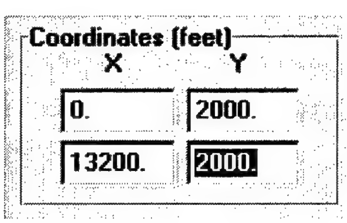
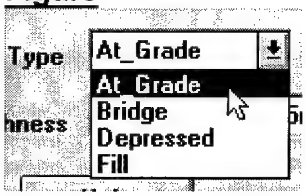
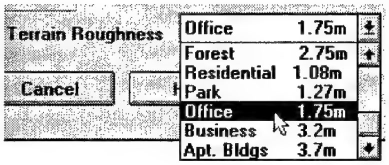
Figure	Action	Result
	1. Select *Roadways* from the *Emissions* menu.	Again, we will be specifying the dispersion information about the road we included in our emissions inventory.
	2. Specify the *Coordinates* (0, 2000), (13200,2000)	We have specified where our two and a half mile long road begins and ends. It will pass in front of the parking lot. Note: The roadway length box is updated based on the coordinates provided

Figure	Action	Result
	3. Set the *Type* to *At_Grade* and the *Terrain Roughness* to *Office*. Also set the *Hourly Operational Profile* to AM-PM Rush	We are assuming that the airport access road is flat and passes through an office district. Your window should look Figure 2-3 when you have finished.
	4. Press *Apply*	
	5. Press *OK*	This updates the changes and closes the window.

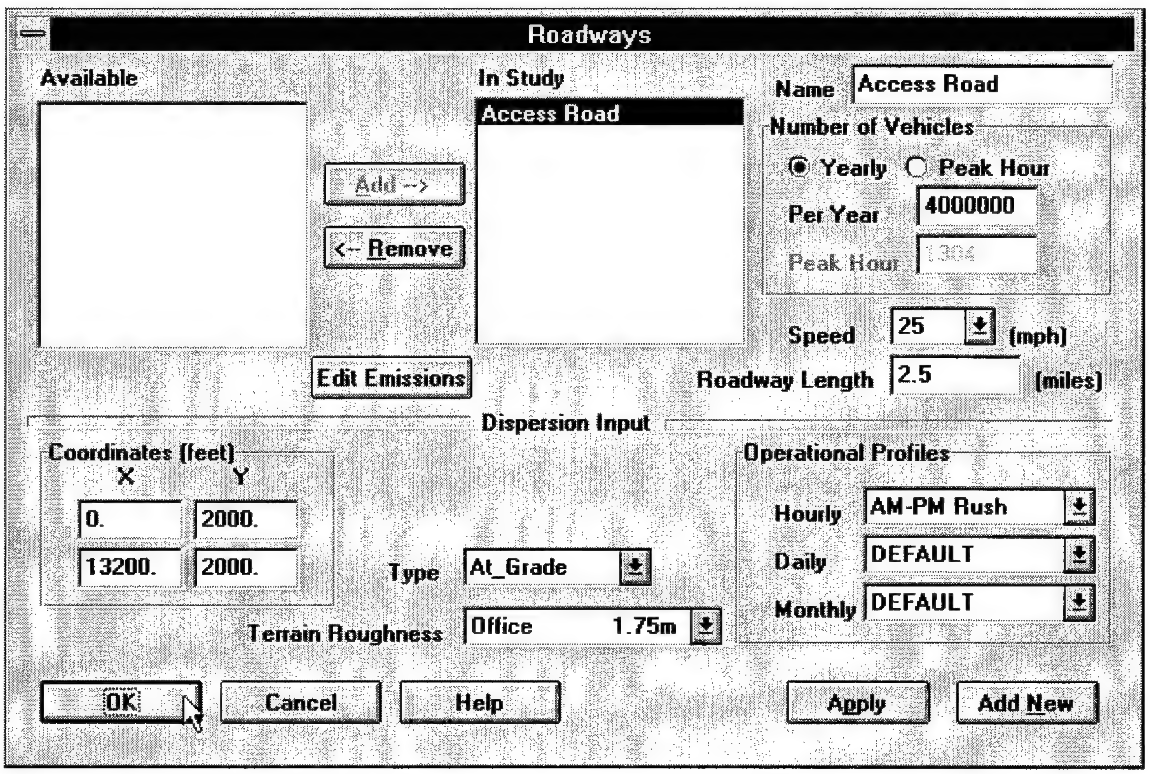
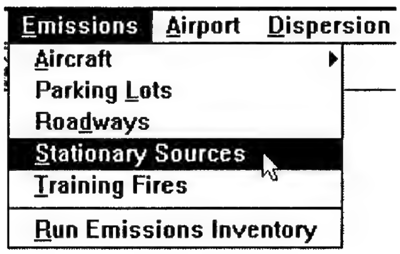
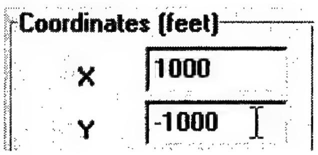
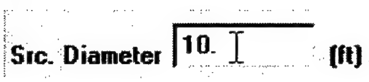


Figure 2-3: Roadways Window

2.2.2.4 Stationary Sources

We are assuming that our power plant is going to be located on the southeast side of the region. The diameter of the exhaust stack is 10 feet and the plant runs 24 hours a day at the same output level.

Figure	Action	Result
	1. Select *Stationary Sources* from the *Emissions* menu	We will be modifying the dispersion values for our power plant.
	2. Place the power plant at location (1000,-1000).	We are locating the facility away from the road, parking lot, and airport.
	3. Set the *Src. Diameter* to 10 feet, and leave the remaining values at their default setting.	Note: We are leaving the operational profiles set to DEFAULT, since we are assuming that the power plant will burn fuel at a constant rate.
	4. Press *Apply*	
	5. Press *OK*	The changes are saved and the window is closed. Figure 2-4 shows the completed screen.

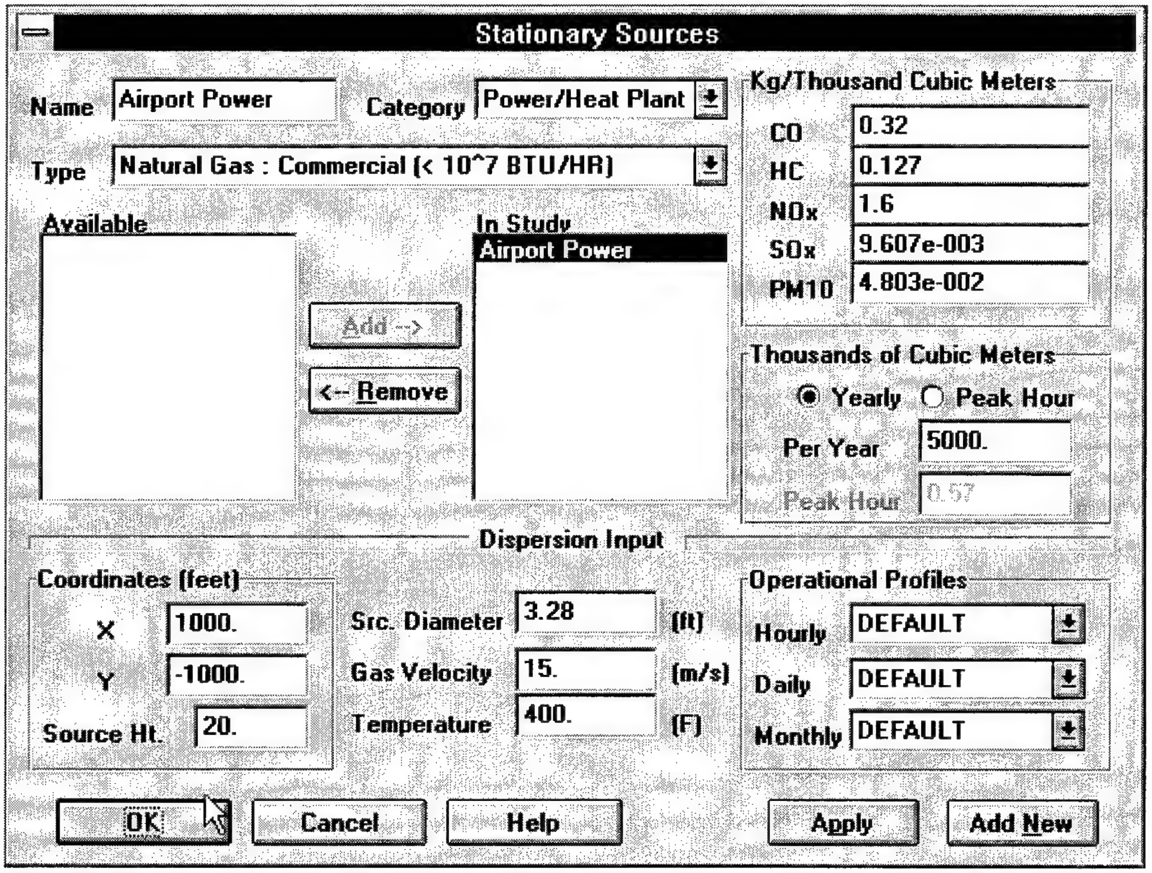
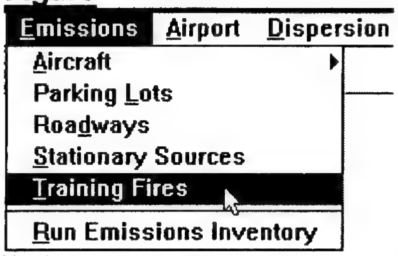
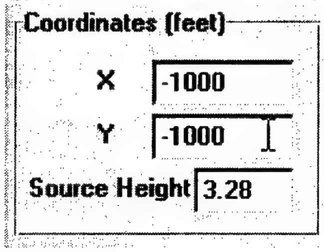
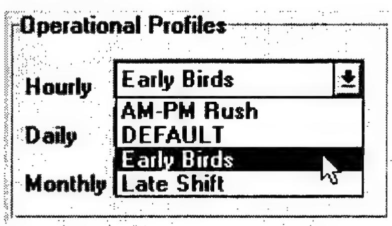


Figure 2-4: Stationary Sources Window

2.2.2.5 *Training Fires*

Our training fire is going to be located on the southwest side of the area and will only be active during the very early morning.

Figure	Action	Result
	1. Select *Training Fires* from the *Emissions* menu.	We will be modifying the dispersion values for our training fire.
 	2. Place the training fire at location (-1000,-1000) and set the *Hourly Operational Profile* to “Early Birds”. Leave the rest of the inputs set to their default values.	We are locating our training fire away from the road, parking lot, and power plant. This also assumes that the training fires will only be set in the early morning, when the area is less likely to be congested.
	3. Press *Apply*	When you have finished, your window should look like Figure 2-5.
	4. Press *OK*	This updates the changes and closes the window.

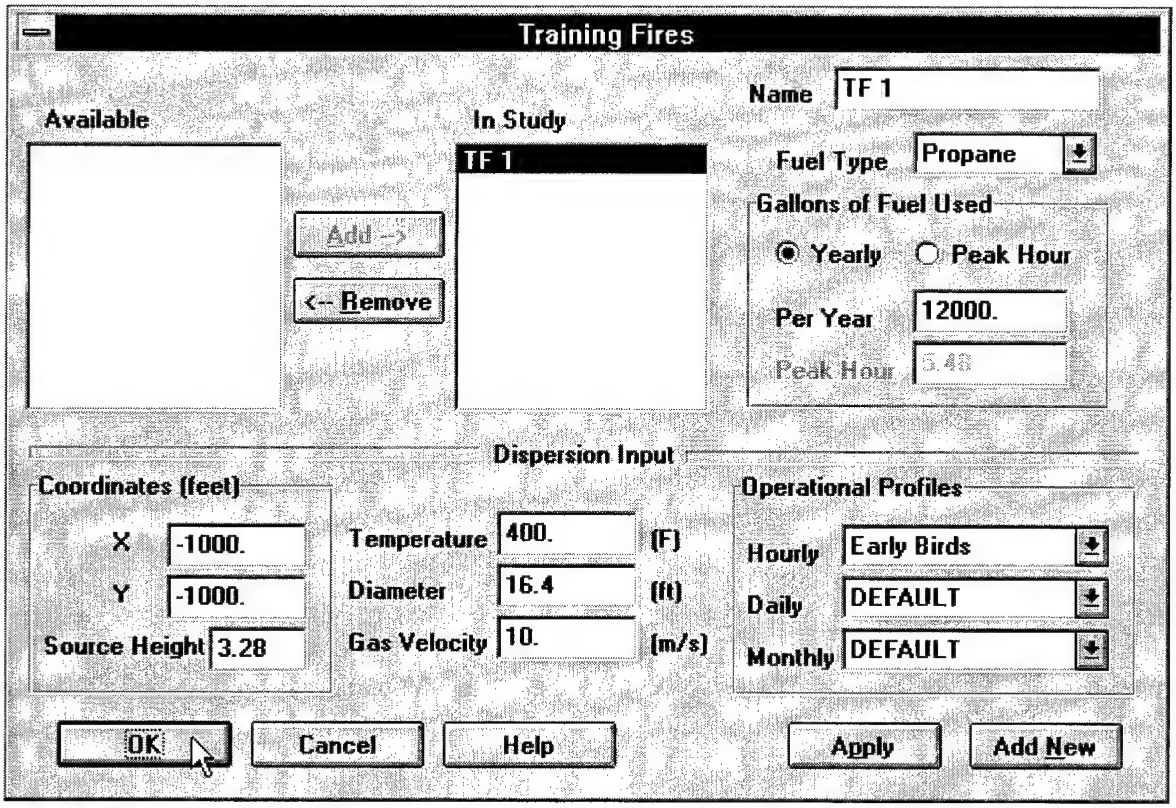


Figure 2-5: Training Fires Window

2.2.3 Airport Menu

Under this menu we will define airport runways, queues, taxiways, gates, and configurations for the purposes of placing aircraft movement and aircraft related activity.

2.2.3.1 Runways

We are going to begin by adding the runways. Corpus Christi has two converging runways, 17-35 and 13-31. We are going to locate them on the northwest side of our modeling area. Figure 2-7, on page B-26, shows the actual layout of CRP.

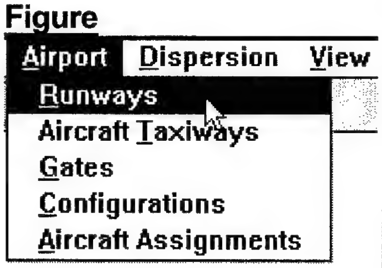
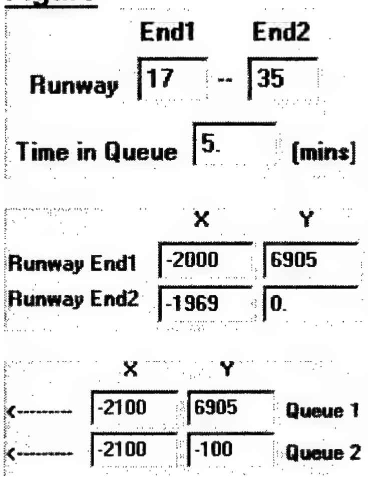
Figure	Action	Result
	1. Select *Runways* from the *Airport* menu.	This opens the window where we can specify the location and layout of the available runways.

Figure	Action	Result



2. Add a new runway called "17-35" with a *Time in Queue* of 5 minutes.

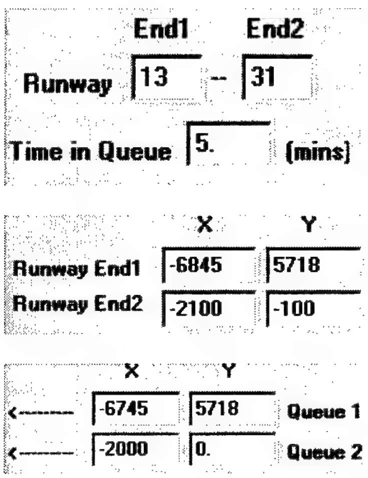
   Corpus Christi has two converging runways (17-35 and 13-31) and the average queue waiting time is 5 minutes.

3. This runway starts at point (-2000,6905) and ends at (-1969,0) with corresponding queues at (-2100,6905) and (-2100,-100).

   This defines the placement of the runway and its queues.

4. Press *Apply*.

   This creates the runway record.



5. Repeat the same procedure for runway "13-31" with the inputs shown in the windows on the left.

   You have now entered the runways into the system. Figure 2-6 shows the completed runways window with the values for runway "13-31" displayed.

6. Press *OK*

   This saves the changes.

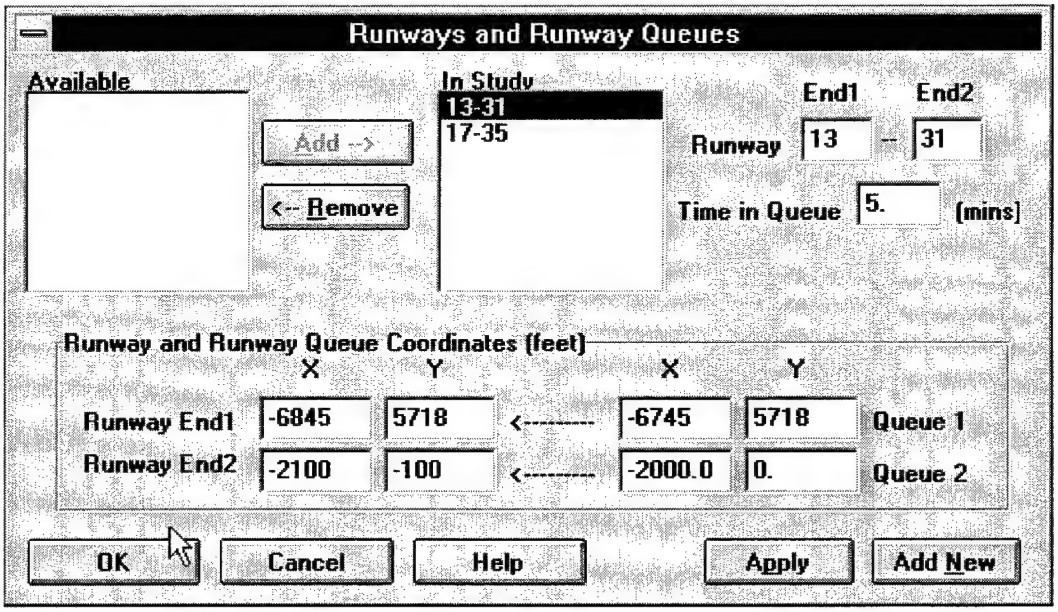


Figure 2-6: Runways Window

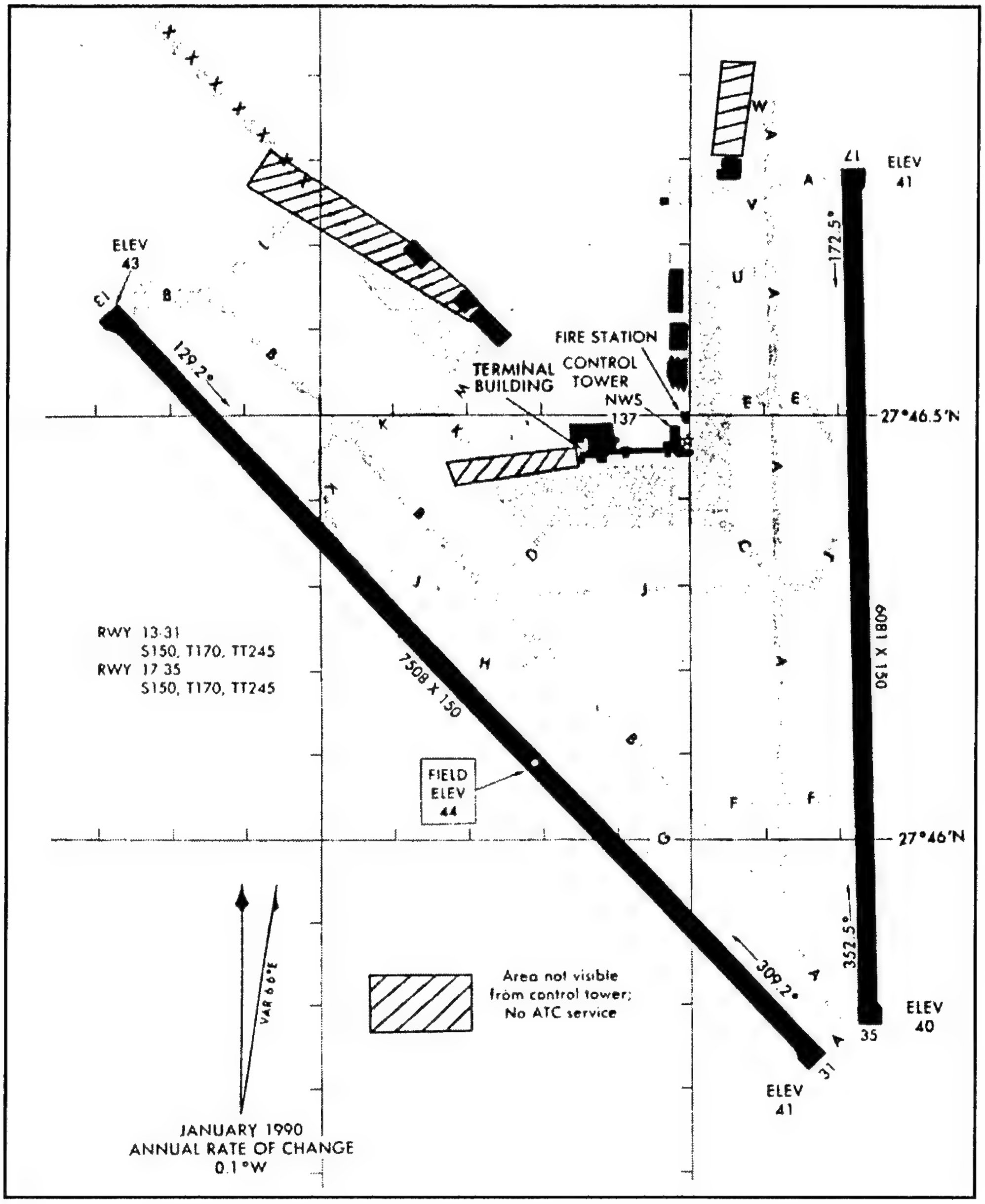


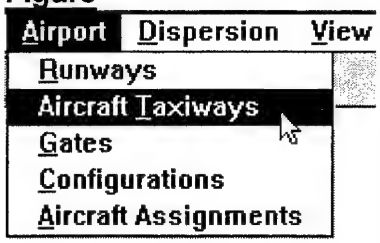
Figure 2-7: Layout of Corpus Christi International Airport[1]

[1] Source: U.S. Terminal Procedures, South Central (SC), April 1993. U.S. Department of Commerce.

2.2.3.2 Taxiways

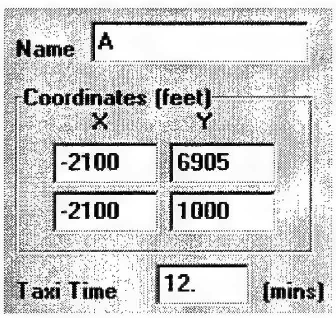
We will include 3 taxiways in our example, modeled after the actual layout at CRP. In reality, it would be appropriate to model all of the active taxiways at an airport, as shown in Figure 2-7.

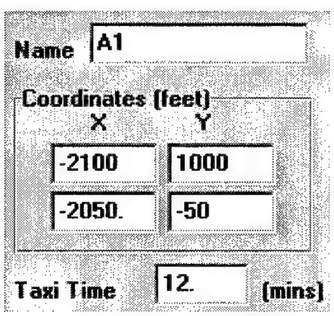
Figure | **Action** | **Result**

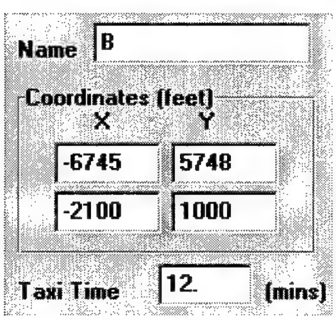


1. Select *Aircraft Taxiways* from the *Airport* menu.

This brings up a window similar to the runways window.







2. Enter the information for taxiways “A”, “A1”, and “B” as shown in the screens on the left.

This creates taxiways parallel to the two main runways which lead directly into the runway queues.

3. Press *Apply* after each taxiway has been edited.

This creates each taxiway record.

4. Press *OK*

This saves the changes. Figure 2-8 shows the completed Taxiways Window with the values for taxiway “A” displayed.

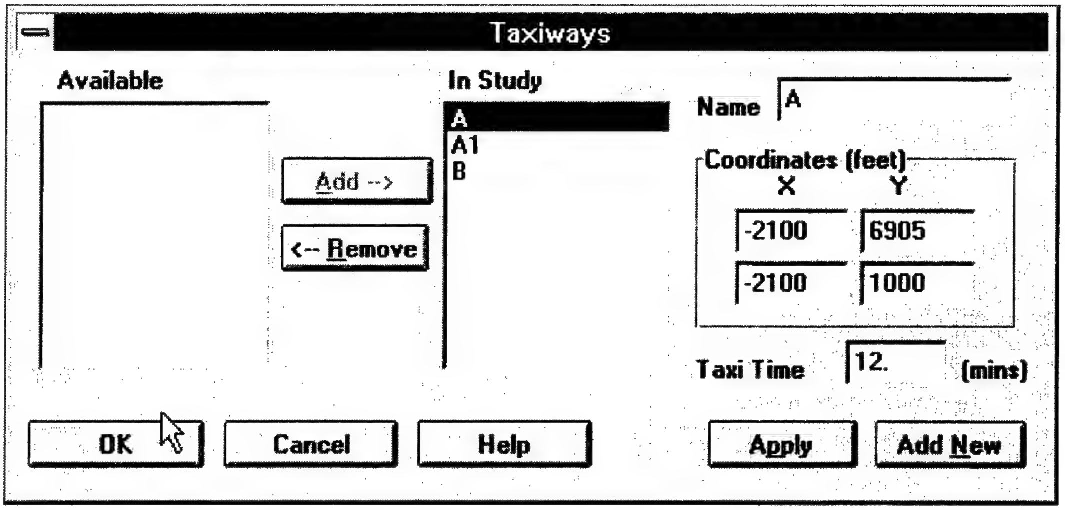
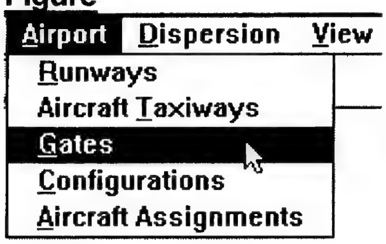
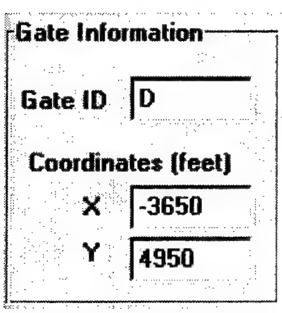


Figure 2-8: Aircraft Taxiways Window

2.2.3.3 Gates

We will add one gate to which all of the aircraft will be assigned.

Figure	Action	Result
	1. Select *Gates* from the *Airport* menu.	This brings up a window similar to the runways and taxiways windows.
	2. Create a gate named "D" at the location (-3650,4950).	This is our single, centrally-located gate.
	3. Press *OK*	This saves the changes. Figure 2-9 shows the completed window.

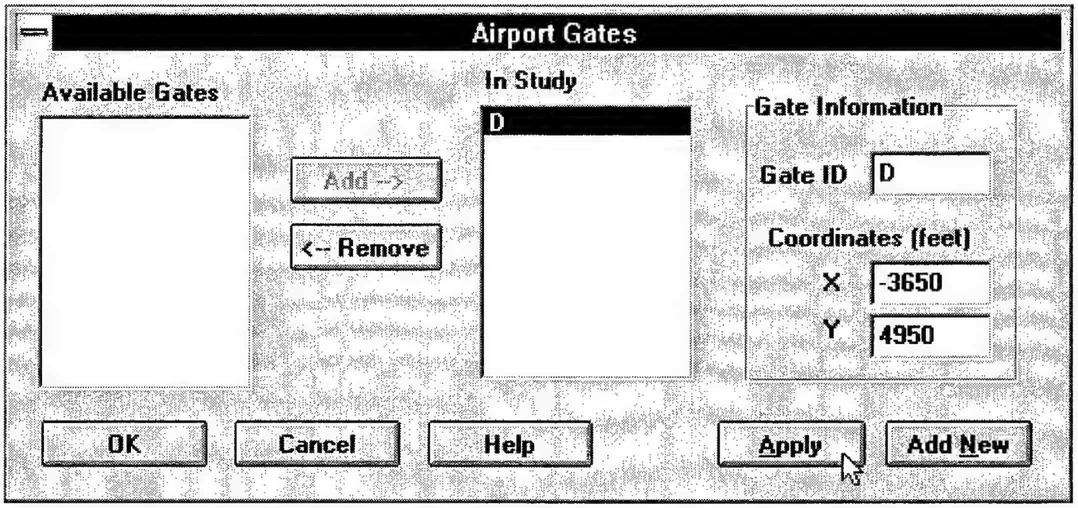
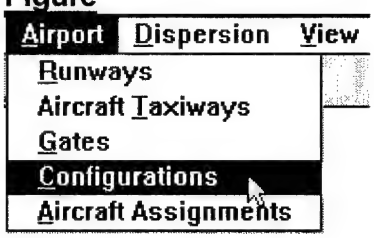
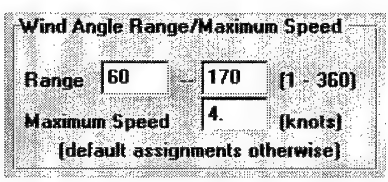
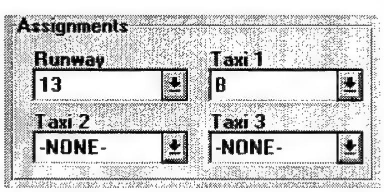


Figure 2-9: Airport Gates Window

2.2.3.4 Configurations

Airports use different configurations based on the current weather conditions. We will define a configuration to be used when the winds are light and out of the southeast. We can select a specific runway and taxiway combination to use when this event occurs. This configuration is only used by the aircraft which are setup to use configurations.

Figure	Action	Result
	1. From the *Airport* menu select *Configurations.*	This brings up a window, which allows you to define configurations for the aircraft to use.
	2. Press *Add New* and name the new configuration "Light SE".	This is our new configuration.
 	3. Enter the *Wind Angle Range and Maximum Speed* as shown in the window. Also assign the *Runway* and taxiway as shown.	We have now defined a configuration which will be used when the winds are less than or equal to 4 knots out of the southeast and which will be using runway "13" and taxiway "B".
	4. Press *Apply*	This adds the configuration to the list.
	5. Press *OK*	This saves the changes to the window and closes it. Figure 2-10 shows the completed window.

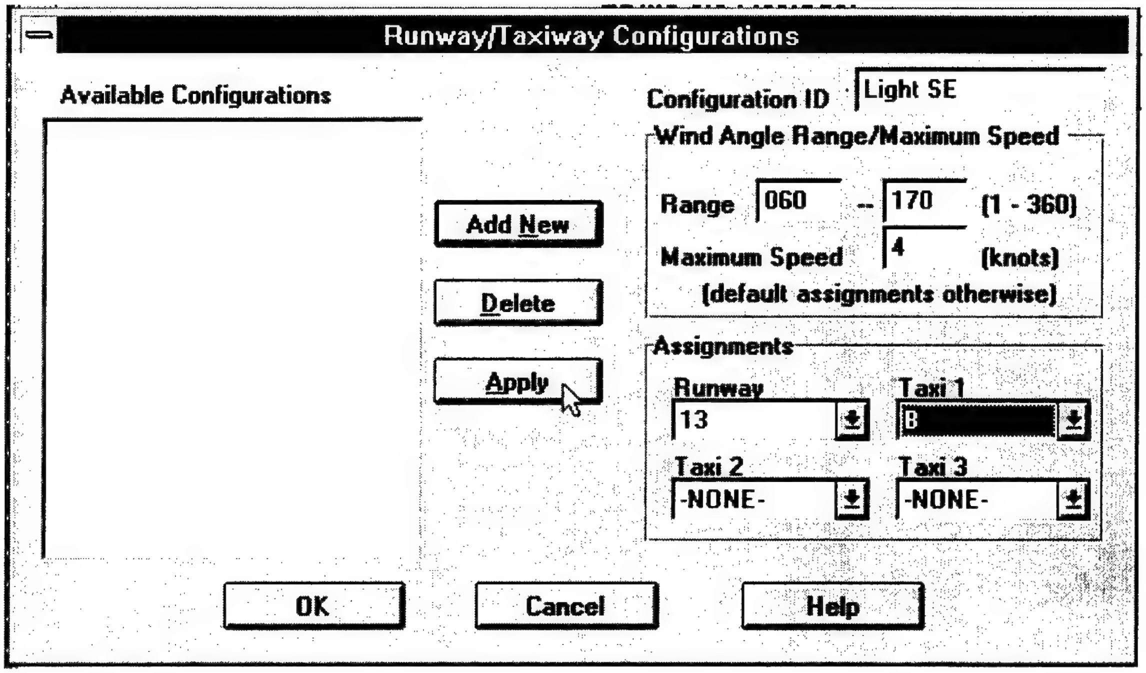
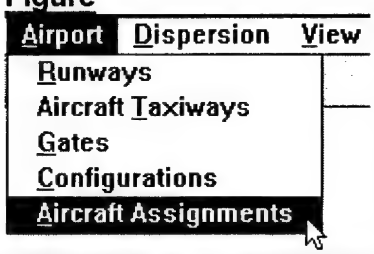


Figure 2-10: Configurations Window

2.2.3.5 Assigning Aircraft

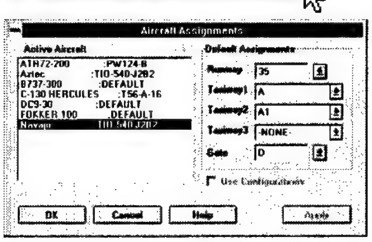
For this example, we are going to assume that the winds are out of the northwest, so all aircraft are going to use runways 35 and 31. The smaller aircraft will use runway 35, since it is shorter, while the larger aircraft will use runway 35. We must not only assign the aircraft to their respective runways, but also to the proper taxiways to arrive at the runway.

Figure | **Action** | **Result**



1. From the *Airport* menu select *Aircraft Assignments.*

   This brings up a window which displays all of the available aircraft and allows you to assign them to runways, taxiways and gates.



2. Assign the ATR, Aztec, and Navajo to runway "35", via taxiways "A" and "A1". The remaining aircraft will use runway "31" via taxiway "B". All of these should be assigned to gate "D". Press *Apply* after making changes to each record.

   We are assuming that all of the aircraft will be departing to the north, and the larger aircraft will use the longer of the two runways. Since there are no configurations defined this option has been disabled.

3. Make sure that *the Use Configurations* box is checked for each of the aircraft.

   If the box is not checked, then the default assignments will always be used.

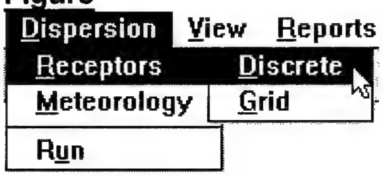
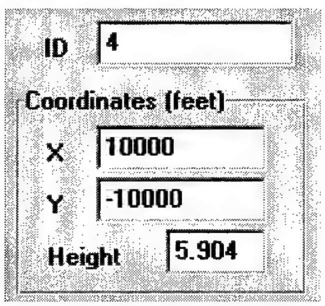
4. Press *OK*

   This saves the changes.

2.2.4 Dispersion Menu

2.2.4.1 Placing Receptors

Please refer to section 4.4 of the Reference Manual for a discussion of proper receptor placement. We will be placing four receptors in the corners of the airport area.

Figure	Action	Result
	1. Select *Receptors*: *Discrete* from the *Dispersion* menu.	This brings up a window which allows you to place individual receptors in your scenario.
	2. Add 4 new receptors named "1", "2", "3", and "4" at locations: (10000, 10000), (-10000, 10000), (-10000,-10000), (10000,-10000) respectively. The inputs for receptor "4" are shown at the left.	This places the receptors in the four corners of the airport region. The receptors are all placed at the default height of 5.9 feet.
	3. Press *OK*.	This saves all changes. Figure 2-11 shows the completed screen with the values for receptor "4" displayed.

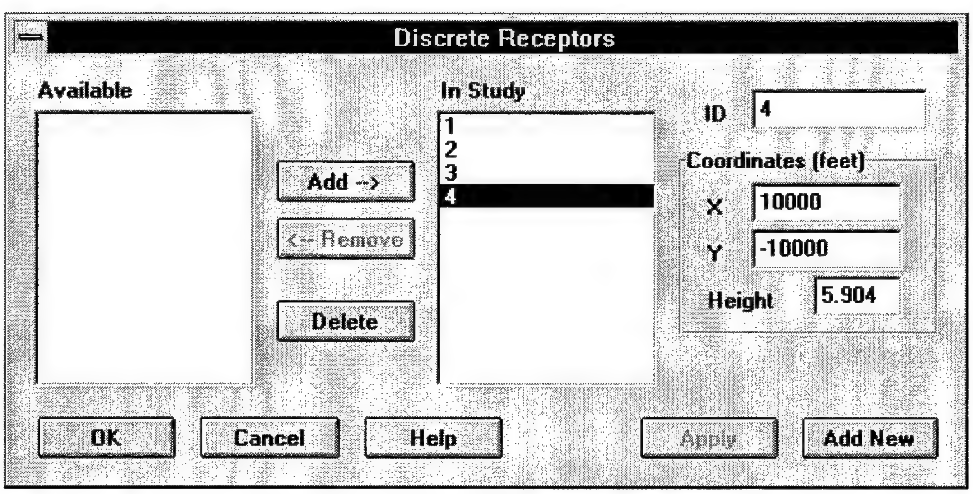
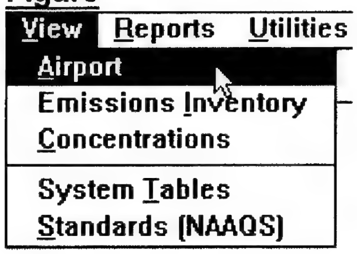


Figure 2-11: Discrete Receptors Window

2.2.4.2 View Airport Layout

Before running dispersion you may actually want to view the airport layout. This capability is found under the *View* menu.

Figure	Action	Result
	1. You can visualize the location of all the entities we have entered up to this point by selecting *Airport* under the *View* menu.	You will see the data we have generated so far. Figure 2-12 shows the airport view screen with the components which we have placed.

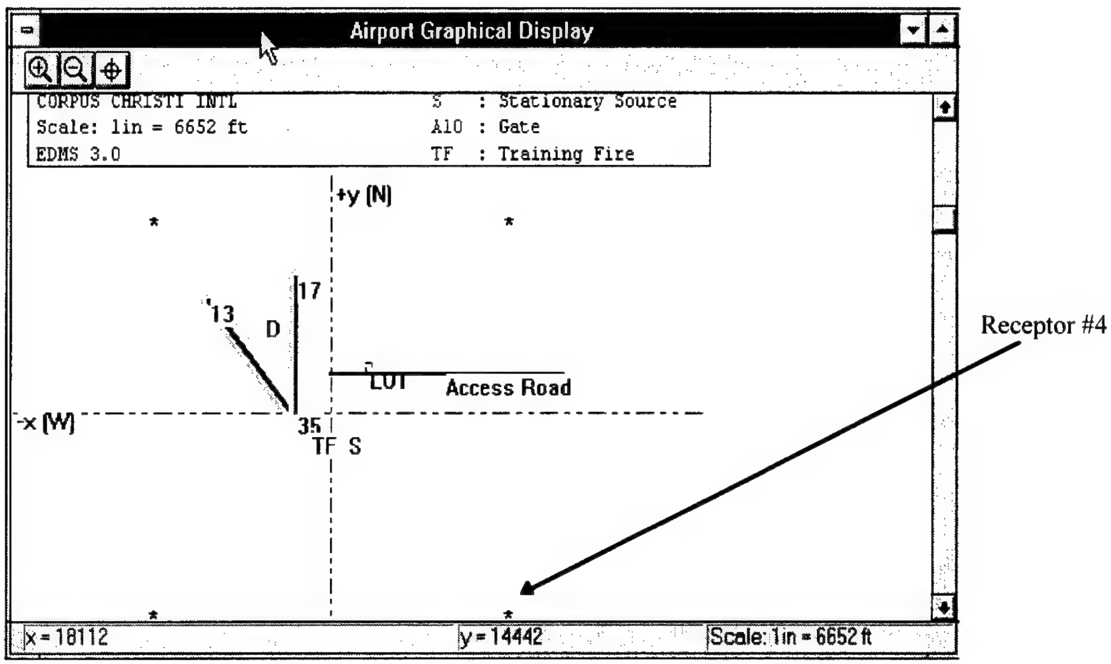
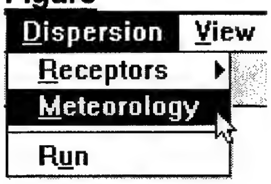


Figure 2-12: Airport Graphical Display Window

2.2.4.3 Meteorological data

In this section we will specify a small set of weather days to be used for our dispersion run. This is an example of generating your own weather data. EDMS also allows NCDC data to be imported.

Figure	Action	Result
	1. Select *Meteorology* from the *Dispersion* menu.	This brings up a window where information about the weather conditions can be specified.
	2. Press the *New Weather File* button and give the file the name SHORT.	This will create a new file called SHORT to be used in our dispersion run.
	3. Fill-in the window with the information displayed on the right half of the screen.	Note: The Month box will fill-in automatically after you press Apply.
	4. Press *Apply*.	Figure 2-13 shows the Meteorological Data window with the created weather records.
	5. Press *OK*	This saves the changes.

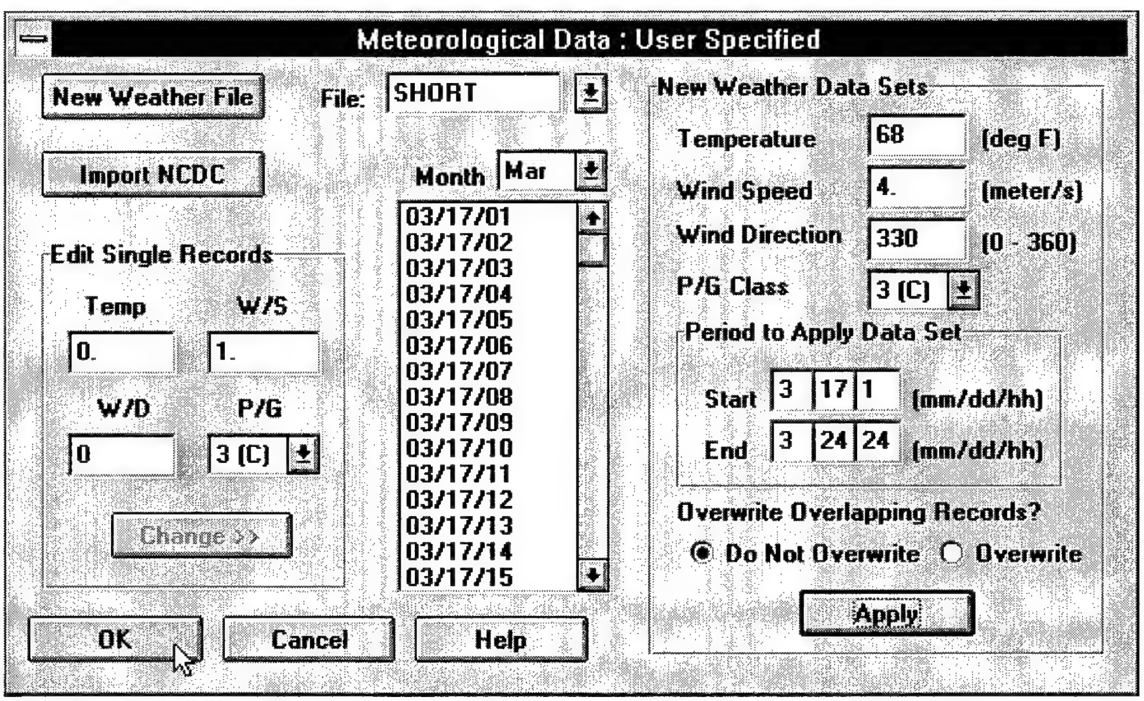
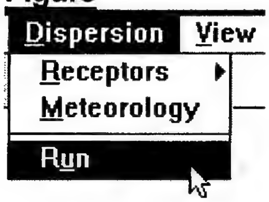
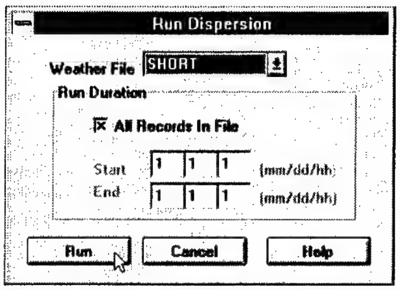
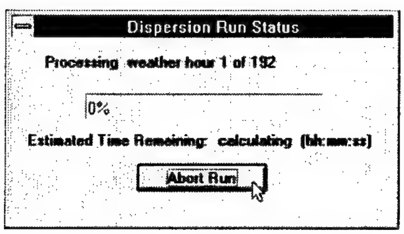
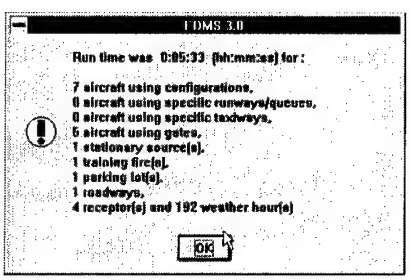


Figure 2-13: User Specified Meteorological Data Window

2.2.4.4 Run Dispersion

At this point we have entered all the data into the model necessary to perform a dispersion analysis.

Figure	Action	Result
	1. Select *Run* from the *Dispersion* menu.	This brings up a window, where you are allowed to select which weather days you wish to run.
	2. The *All Records In File* check-box is checked. Do not uncheck it.	We are going to use all of the weather hours contained in our file.
	3. Press Run	A status window will appear which displays the progress of the dispersion run. You can abort a run at any time, by pressing the abort button.
	4. Press *OK*.	The completion of the dispersion run is signaled by this window. The run should take about 5 minutes depending on your hardware. A summary of the sources, number of receptors, and number of weather hours included in the run is displayed.

2.2.5 Results

Your dispersion run is now complete. You can compare your results with the results in the tutorial file. Figure 2-14 shows the results of a query on the output table for the 25 highest concentrations of CO as a result of all the emissions sources.

View Concentrations: [ALL SOURCES]

Highest 25 Source All Pollutant CO Query

NO.	HOUR	RECEPTOR	X	Y	CO ($\mu g/m^3$)	CO (PPM)
1	03/17/07	4	10000.00	-10000.00	4.0296558311109	0.0035
2	03/17/08	4	10000.00	-10000.00	4.0296558311109	0.0035
3	03/18/07	4	10000.00	-10000.00	4.0296558311109	0.0035
4	03/18/08	4	10000.00	-10000.00	4.0296558311109	0.0035
5	03/19/07	4	10000.00	-10000.00	4.0296558311109	0.0035
6	03/19/08	4	10000.00	-10000.00	4.0296558311109	0.0035
7	03/20/07	4	10000.00	-10000.00	4.0296558311109	0.0035
8	03/20/08	4	10000.00	-10000.00	4.0296558311109	0.0035
9	03/21/07	4	10000.00	-10000.00	4.0296558311109	0.0035
10	03/21/08	4	10000.00	-10000.00	4.0296558311109	0.0035
11	03/22/07	4	10000.00	-10000.00	4.0296558311109	0.0035
12	03/22/08	4	10000.00	-10000.00	4.0296558311109	0.0035
13	03/23/07	4	10000.00	-10000.00	4.0296558311109	0.0035
14	03/23/08	4	10000.00	-10000.00	4.0296558311109	0.0035
15	03/24/07	4	10000.00	-10000.00	4.0296558311109	0.0035
16	03/24/08	4	10000.00	-10000.00	4.0296558311109	0.0035
17	03/17/17	4	10000.00	-10000.00	3.9546801916817	0.0035
18	03/17/18	4	10000.00	-10000.00	3.9546801916817	0.0035
19	03/17/19	4	10000.00	-10000.00	3.9546801916817	0.0035
20	03/18/17	4	10000.00	-10000.00	3.9546801916817	0.0035
21	03/18/18	4	10000.00	-10000.00	3.9546801916817	0.0035
22	03/18/19	4	10000.00	-10000.00	3.9546801916817	0.0035
23	03/19/17	4	10000.00	-10000.00	3.9546801916817	0.0035
24	03/19/18	4	10000.00	-10000.00	3.9546801916817	0.0035
25	03/19/19	4	10000.00	-10000.00	3.9546801916817	0.0035

Figure 2-14: Highest 25 Concentrations of CO

The values listed in this table should correspond to the values on your screen. If they do not, please check your inputs against those listed in the example. Additionally a report may be generated from the *Reports* menu heading.

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